

MISSOURI RIVER
INTERIOR LEAST TERN AND PIPING PLOVER
POPULATION STATUS AND PRODUCTIVITY SUMMARY

including
Permit Activity Report



**US Army Corps
of Engineers**
Omaha District

1994 FIELD SEASON

1994 AT-A-GLANCE
PIPING PLOVER
(CHARADIVS MELODUS)

Missouri River Population Survey & Productivity Monitoring

	ADULT CENSUS	NESTS ATTEMPTED	NESTS HATCHED	NESTING SUCCESS ^a	EGGS	AVE CLUTCH SIZE	EGGS HATCHED	CHICKS FLEDGED	FLEDGING ^b RATIO
Fort Peck Lake (FTPKRES)	4	11	5	45.5	39	3.55	19	3	1.50
Fort Peck River (FTPKRIV)	9	1	0	0.0	3	3.00	0	0	0.00
Lake Sakakawea (LKSKRES)	46	17	13	76.5	63	3.71	43	28	1.22
Garrison River (GARRIV)	116	51	35	68.6	179	3.51	126	57	0.97
Lake Oahe (LKOHRIS)	84	33	18	54.5	124	3.76	61	4	0.10
Fort Randall River (FTRLRIV)	17	6	4	66.7	21	3.50	13	0	0.00
Lewis and Clark Lake (LECLRES)	12	10	1	10.0	33	3.30	4	2	0.33
Gavins Point River (GAPTRIV)	62	52	23	44.2	177	3.40	60	19	0.61
TOTAL	352	181	99	54.7	639	3.53	346	113	0.64

^a Nests hatched per 100 attempted.

^b Chicks fledged per pair of adults

SUBJECT: Annual report on the Missouri River interior least tern (*Sterna antillarum*) and piping plover (*Charadrius melodus*) population status and productivity including activity conducted under endangered species research permit PRT-704930.

PURPOSE: This report is intended to provide annual trend data on the adult populations and production estimates of least terns and piping plovers nesting along monitored reaches of the mainstem Missouri River during 1994. Efforts have been made to standardize data presentation in this report so that comparisons can be made with previous data collected on these reaches. All activities and procedures used to collect this data during the 1994 nesting season are discussed within this document. This report represents compiled data from seven U.S. Army Corps of Engineers Natural Resource Offices and one contracted U.S. Fish and Wildlife Service-Ecological Services Office. If procedural information in greater detail than what is presented herewithin is required for comparative studies, unassimilated field office reports are available from the Operations Division of the Omaha District, U.S. Army Corps of Engineers, Omaha, NE.

INTRODUCTION

The U.S. Army Corps of Engineers (Corps) received a jeopardy Biological Opinion on the operations of the Missouri River Mainstem System from the U.S. Fish and Wildlife Service (USFWS) on November 14, 1990. This Biological Opinion (Opinion) concluded that the operations of the Missouri River would likely jeopardize the continued existence of the interior population of the least tern (*Sterna antillarum*) and the Great Plains population of the piping plover (*Charadrius melodus*). In 1985 the least tern was listed as endangered on the federal Endangered Species List. The northern Great Plains population of the piping plover was listed as threatened in January 1986.

The Opinion included Reasonable and Prudent Measures, Reasonable and Prudent Alternatives, and Conservation Measures that, if implemented, would preclude jeopardy to these species. The preclusion of jeopardy was based on production to be measured by fledge ratios of least terns and piping plovers on the Missouri River. Implementation of recovery measures is to be monitored through annual breeding adult population censuses and productivity surveys. Once productivity standards are achieved they will be maintained and monitored for ten consecutive years.

During the period from 1986-89 the Corps, in anticipation of an Opinion, began funding a series of studies to determine the population distribution of least terns and piping plovers throughout the Missouri River basin, and to determine factors influencing the

decline of these species. Based on findings of these studies, measures were initiated to reduce the impacts of human recreation on nesting areas and water release hydrographs were developed to prevent flooding of nests and pre-fledged chicks.

Upon receiving the Opinion in 1990, the corps intensified efforts to gather life history data and vital rates of piping plovers and least terns nesting on the Missouri River. Universities and the USFWS were contracted to collect this information during a second series of studies. Further measures, resulting from these continuing studies, have been developed and are currently being implemented to deter predation on the nesting colonies, to better control the inundation of low elevation nesting sites, and to retard the loss of habitat due to vegetation encroachment.

1994 represented the second year in the Corps' efforts to undertake census, monitoring, and recovery activities for the two species. Natural resources staff from four Corps Lake Offices and three satellite offices were involved on six of the eight designated reaches of the Missouri River, conducting adult population surveys and productivity monitoring of nesting sites along 720 miles of river and reservoir shoreline. In addition, the Corps contracted with the USFWS-Ecological Services, which surveyed and monitored the two other reaches.

Adult census and nest record data cards that were developed in 1993 were further refined for the 1994 season (See Appendix A Page 45). Training sessions for all staff involved with either the adult surveys or the productivity monitoring were conducted in Bismarck ND. The first session was held on May 3 & 4. The second session was on June 1 & 2. Topics covered included proper survey techniques, chick identification, juvenile aging, permit compliance, and record keeping.

All work was conducted in compliance with the conditions of the endangered species research permit (Regional Blanket Permit PRT-704930, subpermit 93-07). This permit was issued to the U.S. Army Corps of Engineers, Missouri River Division, Omaha, Nebraska, by the USFWS's Denver Regional Office to work on least terns and piping plovers within the Missouri River Basin during 1994. Contracted agencies were individually permitted.

DESIGNATED STUDY AREAS

As in 1993 the study area was divided into river reaches. For 1994 the number of reaches was reduced from nine to eight. (Lake Oahe ND and Lake Oahe SD were combined to form the Lake Oahe Reach.) The agencies and offices responsible for conducting the adult census surveys and productivity monitoring activities during 1994, including river miles of survey and productivity subsample areas, are listed below.

FORT PECK RESERVOIR (FTPKRES)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake Office, Fort Peck, Montana

Adult Census: River Miles 1785.0-1771.0

Productivity: River Miles 1785.0-1771.0

RIVER BELOW FORT PECK RESERVOIR (FTPKRIV)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake Office, Fort Peck, Montana

Adult Census: River Miles 1712.5-1581.5

Productivity: River Miles 1712.5-1673.0

LAKE SAKAKAWEA RESERVOIR (LKSKRES)

Corps Lake Sakakawea Williston Resource Office, Williston, ND

Adult Census: River Miles 1568.0-1480.5

Productivity: River Miles 1568.0-1480.5

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census: River Miles 1480.5-1389.6

Productivity: River Miles 1480.5-1389.6

RIVER BELOW LAKE SAKAKAWEA RESERVOIR (GARRRIV)

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census: River Miles 1389.2-1341.2

Productivity: River Miles 1389.2-1341.2

Corps Lake Oahe Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1341.2-1299.7

Productivity: River Miles 1341.2-1299.7

LAKE OAHE RESERVOIR, (LKOHRRES)

Corps Lake Oahe Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1299.0-1232.0

Productivity: River Miles 1299.0-1232.0

Corps Lake Oahe Mobridge Resource Office, Mobridge, SD

Adult Census: River Miles 1231.5-1165.0

Productivity: River Miles 1231.5-1165.0

Corps Lake Oahe Lake Office, Pierre, SD

Adult Census: River Miles 1165.0-1072.0

Productivity: River Miles 1165.0-1072.0

RIVER BELOW FORT RANDALL DAM (FTRLRIV)

Corps Lake Francis Case Lake Office, Pickstown, SD

Adult Census: River Miles 880.0-845.0

Productivity: River Miles 880.0-845.0

LEWIS AND CLARK RESERVOIR (LECLRES)

Corps Lewis and Clark Lake Office, Yankton, SD

Adult Census: River Miles 845.0-811.0

Productivity: River Miles 845.0-811.0

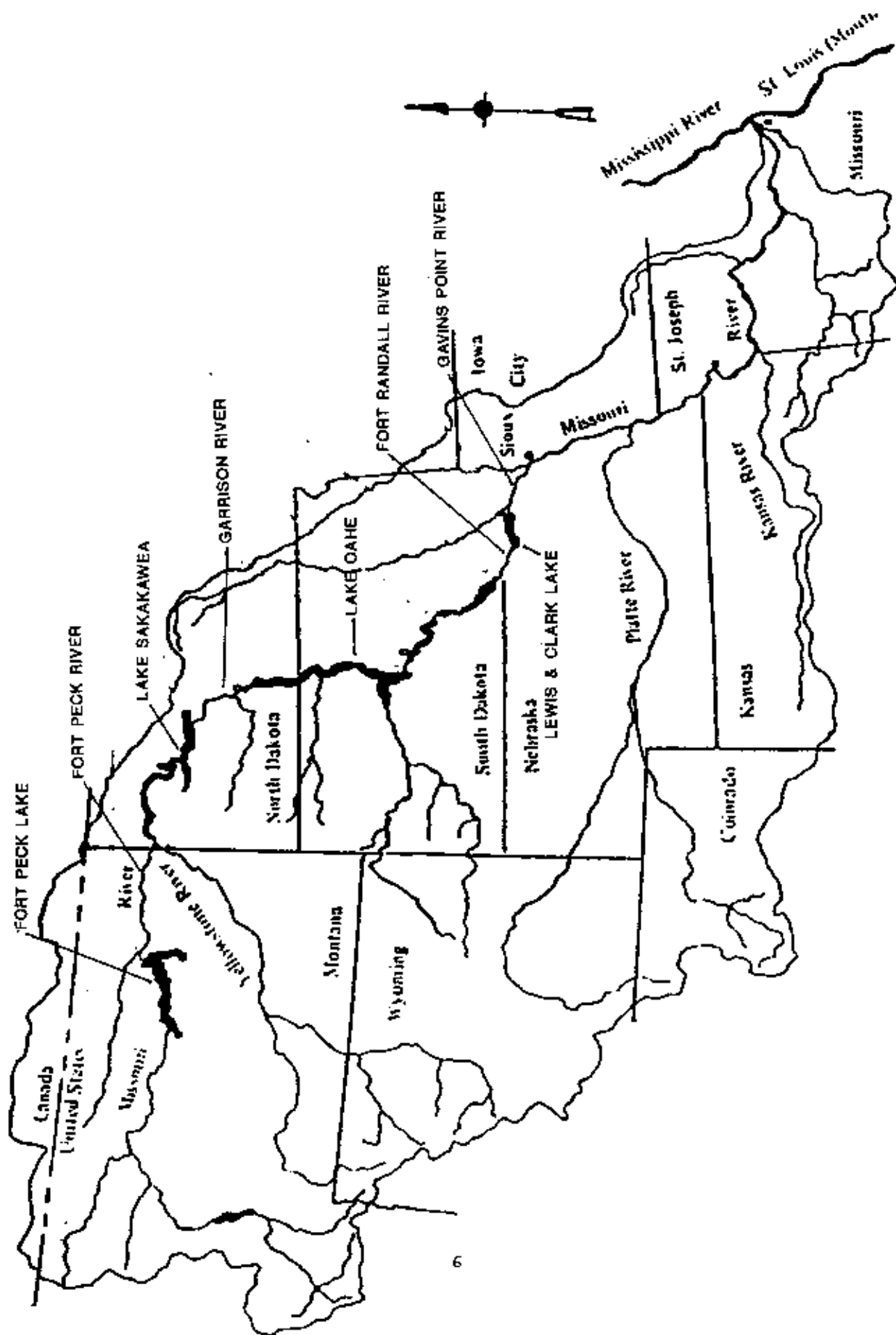
RIVER BELOW GAVINS POINT DAM (GAPTRIV)

Corps Lewis and Clark Lake Office, Yankton, SD

Adult Census: River Miles 811.0-750.0

Productivity: River Miles 811.0-750.0

MISSOURI RIVER STUDY AREAS



REACH DESCRIPTIONS AND HISTORICAL BACKGROUND

Missouri River:

The Missouri River and its tributaries dominate the north central region of the United States. The Missouri begins at the confluence of Madison, Jefferson, and Gallatin Rivers near Three Forks Montana. The river travels 2,300 miles north, east, and southeasterly to its joining with the Mississippi River just north of St. Louis, Missouri. The Missouri and its tributaries drain a basin of over 529,000 square miles, including 9,700 square miles in Canada. The Missouri River Basin includes all of Montana and Wyoming east of the Continental Divide, most of North Dakota and South Dakota, all of Nebraska, the northern halves of Kansas, and Missouri, the northeast part of Colorado, and small portions of western Iowa and southwestern Minnesota.

Topographically the western part of the Basin is dominated by the northern Rocky Mountains. Going east the Rockies give way to the Great Plains which encompasses more than half of the Basin. These high relatively flat lands in turn slope down to the central lowlands in the eastern part of the Basin. In the northern plains the major tributary of the Missouri is the Yellowstone River. The Yellowstone originates in northeastern Wyoming and wanders northeasterly through Montana to its confluence with the Missouri just east of the Montana-North Dakota state line. Other important northern tributaries of the Missouri include the Milk, Little Missouri, Cheyenne, White, James, and Niobrara Rivers.

The Missouri River and its ecosystem have seen vast changes since the coming of the first European explorers in the 1700s. Originally the river meandered through a broad riverine/floodplain forest ecosystem forming braided channels, sandbars, sloughs, chutes, islands, and backwater areas. The system was constantly refreshed by the Missouri's high propensity for flooding. In a typical year river flows would rise in March and April with the snow melt on the plains and ice melt from the rivers and streams feeding the Missouri. There would be a second higher peak in the flows in June as the snow melt from the Rockies reached the river. Flows would then decline through the summer and fall. More often than not however, the Missouri's flows were not typical. It has been estimated that the Missouri would flood on average two out of every three years. This flooding benefited the ecosystem by scouring sandbars of vegetation, by building up existing sandbars, and by creating new islands.

Though flooding benefited the Missouri's ecosystem, it proved disastrous to the towns and industries that sprung up along the river. The flooding of towns and farms would cause loss of life, destroy and damage property, and inundate farmland. The creation of sandbars and shifting of the river channel would make navigation hazardous and difficult on the Missouri. Following a series of destructive floods on the Missouri and Mississippi Rivers in the 1930s the Congress took action. In 1944 the Flood Control Act became law. This legislation authorized the construction of dams on the Missouri and its tributaries as a means of obviating the flood threat. The centerpiece of the construction was the building of five major dams on the Missouri. These dams; Gavins Point on the Nebraska-South Dakota border, Fort Randall, Big Bend, and Oahe in South Dakota, Garrison in North Dakota, and the previously constructed Fort Peck Dam in Montana, became the primary mechanism for controlling floods on the Missouri. To provide for safe navigation the Missouri was channelized and dredged from Sioux City, Iowa to St. Louis.

These construction projects accomplished the goals of reducing flooding on the Missouri and providing a reliable navigation season on the river. However these actions had a detrimental affect on the Missouri's riverine-floodplain forest ecosystem. The reservoirs formed by the dams inundated hundreds of miles of the river. The reservoirs also began serving as depositories for sediment carried by the Missouri. The loss of this sediment has had detrimental effects on the river below the dams. Not only has it eliminated the natural creation of sandbars, it has resulted in significant degradation of the riverbed. With the loss of sediment the riverbed deepens and the elevation of the sandbars above the river rises. The elimination of periodic flooding through the controlled releases from the dams have destroyed the river's ability to scour vegetation from the sandbars. This had led to the encroachment of vegetation onto many of the sandbars located downriver from the dams. The elimination of the flood threat has also led to more residential development along the river. This in turn has led to greater recreational use of the sandbars. Finally the channelization of the Missouri from Sioux City to its confluence with the Mississippi has despoiled it as a natural system.

Fort Peck Lake Reach:

The Fort Peck Lake Reach of the Missouri River consists of the eastern portion of Fort Peck Lake. Fort Peck Lake is the result of the construction of Fort Peck Dam at

Missouri River Mile (RM) 1771.5. Construction on the dam began in 1933 and operation of the facility began in 1940. Fort Peck Lake varies in size from 212,000 acres at elevation 2234 feet mean sea level (msl) to 240,000 acres at elevation 2246 feet msl. The primary water source for the reach is the Missouri River. The Missouri drains around 57,500 square miles of Montana and Canada into the lake.

The land surrounding Fort Peck Lake consists mostly of upland rolling hills and "breaks" containing badlands topography. Several sand and gravel mixed beaches exist along the shoreline of the lake. The size of the beaches varies with the elevation of the lake. Grasslands dominate the vegetation of the region. Some trees and shrubs will be found in coulees and other drainages.

The climate of the Fort Peck Lake Reach is typical of the western Great Plains region, with hot summers, and cold, dry winters. Prolonged droughts and frequent shorter periods of deficient moisture, interspersed with periods of abundant precipitation are characteristic of the area. The average annual temperature is 43 degrees Fahrenheit, with normal summer daily high temperatures ranging in the 80s and 90s, usually accompanied by low humidity. Winter temperatures frequently drop below zero degrees Fahrenheit with temperatures of minus forty degrees being recorded. The reach is a semi-arid region, with normal annual precipitation between ten to twelve inches, 80% of which occurs during April to September. Hail is also a common occurrence in this area. The prevailing winds during April to October are predominately west/northwesterly, and east/ southeasterly. Summer winds are highly variable since they are subject to passing storm systems and fronts.

The primary human activity on Fort Peck Lake is recreation. Recreational use includes fishing, both from shore and boats, pleasure boating, water skiing, camping, and swimming. The majority of project lands that surround the lake are leased to the U.S. Fish & Wildlife Service to form the Charles M. Russell National Wildlife Refuge. Away from the lake agriculture, in the form of livestock raising and some farming, is the dominant industry.

Fort Peck River Reach:

The Fort Peck River Reach of the Missouri River begins at Fort Peck Dam in eastern Montana, RM 1771.5, and travels 203 miles in a southeasterly direction to the

western boundary of Lake Sakakawca in North Dakota (RM 1568.0). The primary water sources for this reach are the releases from Fort Peck Dam, and inflows from the Milk (RM 1761.5), Poplar (RM 1678.9), and Yellowstone (RM 1582) Rivers. Smaller tributaries such as the Big Muddy Creek and Redwater River also contribute to the discharge, albeit to a lesser extent.

The majority of the sandy/silty substrates typically used by terns and plovers in the upper reach are situated downstream of the Milk River confluence, possibly resulting from the Milk River's relatively high contribution of suspended particulate matter. The Poplar River also transports a considerable amount of suspended fine sediments. The islands and sandbars formed by sediment deposition along the Missouri River system are highly dynamic, and are altered by fluctuating river flows. Pre-dam flows were generally high early in the season (spring) and decreased throughout the summer season. High spring flows, in addition to ice, would scour the river basin, accelerating erosion rates and preventing the establishment of emergent vegetation on seasonally-exposed sandy areas. Flows generally decreased in late spring, exposing sandy substrate free of dense vegetation, ideal for tern and plover nesting. The construction of Fort Peck Dam altered normal seasonal flow rates, creating artificial rates which fluctuate daily based on power demand.

On the lower part of the reach the Yellowstone has the potential to greatly influence the Missouri below the confluence of the two rivers. The Yellowstone drains over 70,000 square miles. It is the longest free flowing river in the United States with only one dam, Yellowtail, located on a major tributary, the Bighorn River. Spring runoff from the Yellowstone watershed can dramatically change this portion of the Missouri's appearance from year to year. High runoff will inundate many of the sandbars and islands. Conversely a low runoff exposes miles of sandy beaches.

Three landforms; uplands, breaks, and floodplains, dominate the reach. The Missouri River marks the southernmost advance of the Pleistocene glaciers. The glaciated portions of the area are characterized by level to rolling uplands dissected by coulees and gullies, whereas the unglaciated areas are characterized by low hills, rugged breaks and badlands. Soils in the area result from soft, sedimentary bedrock (sandstone, siltstone, shale), local and regional alluvium, and a small amount of glacial till. The dissected badlands area is composed predominately of loam and clay, creating a high erosion potential. The north side of the river tends toward a broad floodplain while the south side is a combination of floodplain and bluffs dissected by coulees.

The riverbank vegetation contain a combination of mature floodplain cottonwood forest, woody draws in the coulees, grasslands, and farm fields. Several sandbars and islands dot this reach. Vegetation on the islands includes grasses, forbs, shrubs, and willows. Mature cottonwoods will be found on some islands.

The climate of the Fort Peck River Reach is typical of the western Great Plains region, with hot summers, and cold, dry winters. Prolonged droughts and frequent shorter periods of deficient moisture, interspersed with periods of abundant precipitation are characteristic of the area. The average annual temperature is 43 degrees Fahrenheit, with normal summer daily high temperatures ranging in the low 80s and 90s, usually accompanied by low humidity. Winters may be extremely cold with temperatures of minus 40 degrees being recorded. The reach is a semi-arid region, with normal annual precipitation of 11.52 inches, 80% of which occurs during April to September. Runoff is rapid due to the fine texture and high clay content of the soil. Thus, sudden rainstorms can cause major flooding on the watershed. Hail is also a common occurrence in the project area. The prevailing winds during April to October are predominately west/northwesterly, and east/southeasterly. Summer winds are highly variable since they are subject to passing storm systems and fronts

Human activities within the reach include recreation, farming, livestock grazing, bank stabilization projects and water intakes for irrigation. Recreational use includes fishing, both from shore and boats, pleasure boating, and canoeing.

Lake Sakakawea Reach:

The Lake Sakakawea Reach consists of two lakes, Sakakawea and Audubon. Both were created with the impoundment of the Missouri River by the construction of the Garrison Dam. Garrison Dam was constructed in the 1950s by the U.S. Army Corps of Engineers and is the fifth in ascending order of six mainstem dams on the Missouri. The dam is located in central North Dakota at RM 1389.86. From the dam Lake Sakakawea extends 178 miles in a northwesterly direction ending at river mile 1586.00. Lake Audubon is located ten miles northeast of the dam and was created by the placement of a three mile long causeway across the eastern end of Lake Sakakawea. At full pool (1850 feet mean sea level) Lake Sakakawea covers 364,000 acres, making it the largest man made lake in the United States. Lake Audubon covers 17,500 acres.

Water from 181,400 square miles of the Missouri River Basin flow into Lake Sakakawea. Of this, 57,500 square miles of Missouri River drainage are controlled by Fort Peck Dam in Montana. The remaining 123,900 square miles drain from the Yellowstone River and it's primary tributaries; the Big Horn, the Tongue, and Powder Rivers, and from the Milk, Poplar, and Little Missouri Rivers. The Yellowstone River furnishes about 50% of 17,500,000 acre feet of water that annually flows into the headwaters of Lake Sakakawea. The Missouri River provides 42%. The remaining 8% flows into the lake via the Little Missouri River, Little Muddy River, White Earth River, Douglas Creek, and Shell Creek. The major source of water for Lake Audubon is Lake Sakakawea via a pumping station maintained by the Bureau of Reclamation.

The pool elevation Lake Sakakawea varies from an average low of 1834.4 feet msl in March to an average high of 1842.3 feet msl in July. Though uncommon, yearly elevation changes of more than fifteen feet have occurred on the lake. These changes can drastically alter the amount of habitat available to shorebirds including the least tern and piping plover. The lake elevation for Lake Audubon is controlled by the Snake Creek Pumping Station. The elevation is kept stable throughout the spring, summer, and fall under a cooperative agreement between the Bureau of Reclamation, the U.S. Fish & Wildlife Service, and the North Dakota Game & Fish Department. The lake elevation is then drawn down before winter to curb shoreline erosion.

The topography of the Lake Sakakawea Reach is dominated by the Missouri Trench through which flows the Missouri River. This river valley has been flooded nearly 180 miles by the impoundment of the Missouri by the Garrison Dam. The trench is generally three to five miles wide with a maximum elevation between 200 and 250 feet. Throughout its length the trench is dissected by intermittent stream valleys and coulees draining into the Missouri.

The Lake Sakakawea Reach is located in the high latitude continental climate. This climate is marked by long cold winters where the temperature frequently drops below zero degrees F with temperatures of -40 degrees F. being recorded. Summer maximums range in the mid 80 degrees F though temperatures above 100 degrees F are not uncommon. The lake surface is frozen about four months out of the year with the average ice up occurring on December 25 and average ice out on April 21. The prevailing wind is from the west to northwest. The wind averages around eleven miles per hour but winds have been clocked at greater than seventy miles per hour. Though infrequent, tornadoes can occur. The

precipitation averages around fourteen to fifteen inches per year with 75% occurring during the months of April through September.

Five vegetation communities are found within the project boundaries of the Lake Sakakawea Reach. In ascending order from the lake they are Aquatics, Flood Plain, Riparian-Woody Draws, Lowland Grasslands, and Upland Grasslands.

The land surrounding the Lake Sakakawea Reach is almost entirely owned by the federal government and administered by the U.S. Army Corps of Engineers. Land use activities include wildlife management, livestock grazing, farming, and recreation. Potential conflicts with terns and plovers exist with the last three uses. Livestock use beaches favored by the birds for watering purposes. Farmers use the shoreline for irrigation pumps. People use the shoreline and island beaches for camping, picnicking, sightseeing, off road vehicle driving, exercising pets, and other recreation activities.

The completion of Garrison Dam in the 1950s dramatically changed the hydrograph in the Lake Sakakawea Reach. About 160 to 180 miles of riverine habitat was destroyed and replaced by a reservoir. The presence of nesting least terns and piping plovers within the reach shows the birds have adapted to this changed ecosystem. Despite this adaptation, it must be concluded that the loss of such extensive riverine habitat has detrimentally affected the two species.

Garrison River Reach:

The Garrison Reach of the Missouri River begins at the Garrison Dam in west central North Dakota (RM 1389.9) and travels south 90 miles to the northern boundary of Lake Oahe located just south of Bismarck ND (RM 1299). The vast majority of water for this reach is supplied through releases from Garrison Dam. The only major tributaries within the reach are the Knife (RM 1374.5) and Heart (RM 1311.3) Rivers. The contributions of the two rivers are minimal except for occasional flooding within their watersheds.

The Missouri on this reach is free flowing, however it is constrained by bank stabilization projects and the dam has eliminated periodic flooding. The topography is that of a relatively flat floodplain with some breaks and upland areas. Cutbanks vary from 5 to 35 feet in height. Usable nestings islands and sandbars begin at RM 1380 and continue downstream throughout the stretch. These islands and bars have traditionally been forming

and eroding throughout the history of the Missouri River. Since closure of the Garrison Dam the islands and bars have been eroding with little or no additional formation due to the reduced silt load and stabilization projects on both banks of the river.

Vegetation has become established on nearly all of the islands. These include grasses, forbs, and shrubs. The islands which rarely or never become inundated have mature woody vegetation including sand willows and cottonwoods. The existing vegetation along the banks is either overmature dying cottonwoods or under some type of agriculture regime - grazing and farm lands.

The reach is located in the high latitude continental climate. This climate is marked by long cold winters where the temperature frequently drops below zero degrees F with temperatures of -40 degrees F. being recorded. Summer maximums range in the mid 80 degrees F though temperatures above 100 degrees F are not uncommon. The prevailing wind is from the west to northwest. The wind averages around ten miles per hour but winds have been clocked at greater than seventy miles per hour. Though infrequent, tornadoes do occur. The precipitation averages around fourteen to fifteen inches per year with 75% occurring during the months of April through September.

Human activities within the reach include recreation, agriculture, bank stabilization projects, water intakes for cities and power plants, and housing developments. Recreational use includes fishing, both from shore and boats, pleasure boating, jet skis, canoeing, water skiing, beach sports, swimming and sunbathing. Fishing enthusiasts may be found all over the reach. The other recreational activities are concentrated in the reach areas adjacent to the Bismarck-Mandan metropolitan area. Likewise the majority of the riverside housing developments are found near Bismarck-Mandan. Other riverside communities may be found near Stanton, Washburn, and Wilton ND.

Several bank stabilization projects have been conducted over the years along the river. They have been sponsored by state, Federal and local entities including private individuals and companies. About 50% of the shoreline between the Garrison Dam and Bismarck ND is under some form of bank protection (abutments, jetties and riprap).

Lake Oahe Reach:

The Lake Oahe Reach was created with the impoundment of the Missouri River by the construction of the Oahe Dam. Oahe Dam was constructed in the 1950s and 1960s by

the U.S. Army Corps of Engineers and is the fourth in ascending order of six mainstem dams on the Missouri. The dam is located in central South Dakota five miles north of Pierre at RM 1072.3. Lake Oahe continues north for 227 miles and ends just south of Bismarck ND (RM 1299). At full pool (1617 feet mean sea level) Lake Oahe covers 360,000 acres, making it the second largest man made lake in the United States. Water from 243,490 square miles of the Missouri River Basin flow into Lake Oahe. Of this, 123,900 square miles of Missouri River drainage are controlled by Garrison Dam in North Dakota. The major contribute of water to Lake Oahe is the Missouri River. Other rivers that flow into the lake include the Cannonball, Grand, Moreau, and Cheyenne.

The topography of the reach consists of primarily of rolling hills and plains interspersed with some ridges and buttes. These forms give way in the north to the relatively flat and non-inundated floodplain of the Missouri River. The land surrounding Lake Oahe contains a variety of habitats. In the floodplain the cottonwood forests have been reduced to corridor riverine habitat by the development of farmland and pasture. High islands that remain above water during peak flows are now often heavily to moderately vegetated. The sandbars that emerge during low water levels are clean to lightly vegetated although these bars easily become inundated. Up from the lake grasses dominate the upland prairies. Mixed in are a variety of wildflowers and some shrubs. Connecting the uplands with lake are numerous coulees and draws that contain an assortment of trees and shrubs.

The land surrounding Lake Oahe is almost entirely owned by the federal government and administered by the U.S. Army Corps of Engineers. Land use activities include wildlife management, livestock grazing, farming, and recreation. Potential conflicts with terns and plovers exist with the last three uses. Livestock use beaches favored by the birds for watering purposes. Farmers use the shoreline for irrigation pumps. People use the shoreline and island beaches for camping, picnicking, sightseeing, off road vehicle driving, exercising pets, and other recreation activities.

The Missouri River and surrounding land have undergone extensive change since the completion of Oahe Dam. Prior to its impoundment the Missouri River was a meandering and dynamic river which constantly eroded and deposited sandbars and islands. These sandbars and islands had the vegetation continuously scoured off by heavy spring flows and ice. These actions created habitat favorable to nesting terns and plovers. Over two hundred miles of this habitat was inundated by Lake Oahe. Periodic low lake levels temporarily recreates some of this habitat on the northern part of the lake. The current

operating procedure for Lake Oahe calls for a peak pool elevation in May followed by slowly declining levels. This regime uncovers shoreline and some islands in the northern part and must be considered favorable for terns and plovers. Naturally, the lower the beginning elevation the more habitat that is available.

For the terns and plovers, the thirty miles of Lake Oahe below the headwaters, the lake exhibits riverine characteristics. This portion offers the least terns and piping plovers sandbars for nesting when Oahe's pool elevation is below 1604' mean sea level (msl) and discharges from Garrison Dam are less than 15,000 cubic feet per second (cfs). At higher pool levels and or higher discharge rates, most of the sandbars become inundated. The majority of available habitat will become inundated with a increase to only 17,500 cfs flows. Most of the sandbars have a sand/gravel composition although bars that emerge when the high water levels recede are often silty and quickly acquire an algal growth.

Oahe Dam has a greater effect on the rest of Lake Oahe than can be seen on the northern portion. The lake has few sandbars, but does have an extensive shoreline. This leaves limited habitat for the terns and plovers. The few islands that are on the lake are heavily vegetated and the shoreline is subject to rapid change with rising and falling pool levels. The only extensively used habitat in the lower part of the lake is a silt and sand man-made island (Dredge Island) at RM 1270.0 and Porcupine Island at RM 1249.0. New sandbars are rarely created on the lake or the river. The lake's shoreline offers nesting areas where sandbars are not present. The width of the shoreline varies with the pool level. Historically, little lakeshore habitat is available with pool elevations above 1600' msl. Lakeshore habitat used for nesting have a sand/pebble composition with an abundance of driftwood and scattered cottonwoods. This habitat is marginal at best and is often subject to cattle and human disturbance.

Fort Randall River Reach:

The Fort Randall Reach of the Missouri River begins at the Fort Randall Dam in southeast South Dakota (RM 880.0) and travels in a southeasterly direction 39 miles to the western boundary of Lewis & Clark Lake (RM 841). The majority of water for this reach is supplied through releases from Fort Randall Dam. The primary tributary on this reach is the Niobrara River which joins the Missouri at RM 844.

The Missouri here is free flowing, however controlled releases from Fort Randall Dam has eliminated periodic flooding for most of the reach. The last three miles of the reach can be effected by flooding on the Niobrara. The topography is that of a relatively flat floodplain that gives way to upland areas. The uplands in turn are dissected by coulees and ravines that lead down to the river.

The floodplain forest is the dominant ecosystem along the river. In many areas along both banks however the forest has been eliminated and replaced by farm lands. Without the scouring by floods vegetation has become established on most of the islands in the reach. These include grasses, forbs, and shrubs. Some islands that seldom, if ever, are inundated have developed stands of cottonwoods.

The reach is located in an area typical of a continental-interior climate with great variations in weather not only from season to season but also from year to year. Hot summers and cold winters are typical with humidity ranging from an average of 60% in the afternoon to 80% during the night and early dawn. The frost-free period in the area averages 155 days. Precipitation in the region averages 25 inches of rainfall annually with the majority of it occurring during the spring and summer months. The average seasonal snowfall for the reach is around 30 inches. Thunderstorms can be expected to occur about 45 days out of the year and tornado and severe weather pass through the region infrequently. Temperatures can exceed 100 degrees Fahrenheit in summer and drop to below 0 degrees in the winter months. The average summer daily temperature is 72 degrees and the average winter daily temperature is 24 degrees. The winds are predominantly from the south-southwest during the summer and from the northwest during the winter months. Wind speeds vary greatly, and it is not uncommon to have winds up to 50 mph during the course of the year.

Human activities within the reach include recreation, agriculture, bank stabilization projects, water intakes for cities, and housing developments. Recreational use includes fishing, both from shore and boats, pleasure boating, jet skis, canoeing, swimming and sunbathing. In the Niobrara Scenic River Designation Act of 1991 this 39 mile portion of the Missouri was designated a National Recreation River. With this designation increased recreation pressure on the reach is expected. With the construction of the Fort Randall Dam and the elimination of a flood threat several trailer park communities have sprung up along the river. The establishment of these trailers, primarily on the Nebraska side of the river,

and the development of agriculture tracts on both sides of the river has led to an increased demand for more bank stabilization projects.

Lewis & Clark Lake Reach:

The Lewis & Clark Lake Reach was created with the impoundment of the Missouri River by the construction of the Gavins Point Dam. Gavins Point Dam was constructed in the 1950s by the U.S. Army Corps of Engineers and is the first in ascending order of six mainstem dams on the Missouri. The dam is located on the South Dakota Nebraska border four miles west of Yankton SD at RM 811.1. From the dam Lewis & Clark Lake extends thirty miles in a westerly direction ending at RM 841. At full pool (1208 feet mean sea level) Lewis & Clark Lake covers 28,000 acres.

Water from 279,480 square miles of the Missouri River Basin flow into Lewis & Clark Lake. All but 16,000 square miles of this drainage is controlled by Fort Randall Dam which is 39 miles upriver from the lake. Most of Lewis & Clark's uncontrolled drainage comes from the Niobrara River which enters the Missouri three miles west of the lake's western boundary. The Niobrara transports a heavy load of silt and sand into the reach. It is estimated the Niobrara contributes 60% of the annual sediment inflow to the lake, making it the major contributor to the accumulation of sand bars and delta formation in the upper third of the lake.

Lewis & Clark is a relatively stable lake that is managed between a three and half foot maximum (1208.0 msl) and minimum (1204.5 msl) operating pool levels. Under flood conditions the lake can be raised an additional two feet to 1210.0 msl. The reach's topography is divided into two distinct types. On the eastern half the lake is confined between hills and ridges that rise to 100 feet above the lake. The western half is a relatively flat floodplain headwaters mixture of braided channels and islands that become rolling hills away from the lake.

The reach is located in an area typical of a continental-interior climate with great variations in weather not only from season to season but also from year to year. Hot summers and cold winters are typical with humidity ranging from an average of 60% in the afternoon to 80% during the night and early dawn. The frost-free period in the area averages 155 days. Precipitation in the region averages 25 inches of rainfall annually with the majority of it occurring during the spring and summer months. The average seasonal

snowfall for the project area is 34 inches. Thunderstorms can be expected to occur about 45 days out of the year and tornado and severe weather pass through the region infrequently.

Temperatures range from an excess of 100 degrees Fahrenheit in summer to below 0 degrees Fahrenheit in the winter months. The average summer daily temperature is 72 degrees and the average winter daily temperature is 24 degrees. Winds in the area of the lake are predominantly from the south-southwest during the summer and from the northwest during the winter months. Wind speeds vary greatly, and it is not uncommon to have winds up to 50 mph during the course of the year. The highest average wind speed for a one month period occurs during the month of April, with a daily average of 14 mph.

Four vegetation communities are found within the project boundaries of the Lewis & Clark Lake Reach. In ascending order from the lake they are Aquatics, Floodplain, Riparian-Woody Draws, and Upland Tallgrass and Mixed Grass Prairie.

The land surrounding the Lewis & Clark Lake is owned by the federal government and administered by the U.S. Army Corps of Engineers. The primary land use activities are wildlife management and recreation. Recreation activities include camping, picnicking, sightseeing, fishing, hunting, pleasure boating, water skiing, sailing, swimming, scuba diving, and sunbathing. Visitation to the lake topped 2.5 million visitors in 1994.

Gavins Point River Reach:

The Gavins Point Reach of the Missouri River begins at the Gavins Point Dam in southeast South Dakota northeast Nebraska (RM 811.1) and travels in a southeasterly direction 58 miles to Ponca NE (RM 753.0). The majority of water for this reach is supplied through releases from Gavins Point Dam. The two primary tributaries on this reach are the James River which joins the Missouri at RM 800.5 and the Vermillion River which enters at RM 772.0.

The Missouri here is free flowing, however controlled releases from Gavins Point Dam has eliminated periodic flooding for most of the reach. The reach can be effected by flooding from the James and Vermillion Rivers. The topography of the reach is that of a relatively flat floodplain on the South Dakota side with floodplain interspersed with steep, tree covered bluffs on the Nebraska side.

The floodplain contains a mixture of various stages of floodplain forest and cleared land used for farming and livestock grazing. The dominant species of the mature floodplain

forest are large cottonwood trees. Understory species include dogwood, willows, eastern red cedars, sumac, wild grape, and poison ivy. On sandbars annual weeds, short lived grasses, sedges, and seedling willows and cottonwoods take root. On the north facing bluffs on the Nebraska side the hardwood forest dominates. Oak, ash, mulberry, and walnut trees will be found with the Bur Oak being the most prevalent. On hilltops and bluffs with southern or western exposures, the hardwood forest gives way to grasslands.

The reach is located in an area typical of a continental-interior climate with great variations in weather not only from season to season but also from year to year. Hot summers and cold winters are typical with humidity ranging from an average of 60% in the afternoon to 80% during the night and early dawn. The frost-free period in the area averages 155 days. Precipitation in the region averages 25 inches of rainfall annually with the majority of it occurring during the spring and summer months. The average seasonal snowfall for the reach is around 30 inches. Thunderstorms can be expected to occur about 45 days out of the year and tornado and severe weather pass through the region infrequently. Temperatures can exceed 100 degrees Fahrenheit in summer and drop to below zero degrees in the winter months. The average summer daily temperature is 72 degrees and the average winter daily temperature is 24 degrees. The winds are predominantly from the south-southwest during the summer and from the northwest during the winter months. Wind speeds vary greatly, and it is not uncommon to have winds up to 50 mph during the course of the year.

Human activities within the reach include recreation, agriculture, bank stabilization projects, water intakes for cities, and housing developments. Recreational use includes fishing, both from shore and boats, pleasure boating, jet skis, canoeing, swimming and sunbathing. In 1980 the Congress designated this stretch of the Missouri as a National Recreation River.

An important function of this reach is it's service as a corridor to provide water for the Missouri River navigation channel. The navigation channel extends from Sioux City, Iowa (RM 732.3) to the confluence of the Missouri and Mississippi Rivers (RM 0.0) just north of St. Louis, Missouri. Normally the navigation season on the Missouri runs for eight months, from April 1 to December 1. The season can be lengthened or shortened depending upon ice conditions on the river, water storage in the mainstem reservoirs, and water inflows from tributaries downriver from Gavins Point. To provide for minimum navigation service, releases from Gavins Point Dam must average 24,800 cfs in May, 24,000 cfs in

June, 26,700 cfs in July, and 28,200 cfs in August. For full navigation service, releases must average 30,800 cfs in May, 30,000 cfs in June, 32,700 cfs in July, and 34,200 cfs in August.

HABITAT OBSERVATIONS & NEST INITIATIONS

Habitat use surveys to locate active nesting colonies and nest sites for monitoring purposes were conducted from May to July on the reaches. Surveys were conducted with the aid of binoculars or spotting scope. Potential nesting areas were typically observed from a boat. Large islands or beach areas accessible from land were searched on foot using bird behavior to indicate active nesting colonies. Sites found to have terns or plovers actively exhibiting nesting or courting behavior were recorded on U.S. Army Corps of Engineers aerial mosaic maps (Appendix C Page 57) and monitored during production surveys. Habitat conditions and nest initiations on the reaches are as follows.

Fort Peck Lake: The elevation of Fort Peck Lake stood at 2238.1 feet mean sea level (msl) on May 2, the date of the first survey of the year. This represented a 27 foot increase in lake elevation compared to the same time the previous year. This had profound impacts on the availability, distribution, and quality of habitat for plovers and terns. For the previous seven years the area above elevation 2238 feet msl had not been inundated which allowed for substantial vegetation growth. This vegetation growth severely diminished both the number of suitable nesting beaches and the size and quality of the beaches available to the two species. Few gravelly areas were available to the birds for nesting. Field personnel found that the birds nested in these gravelly areas and shorelines dominated by shale substrates. The birds had never been known to previously nest in these shale areas. For the most part the nests located in the shale areas were unsuccessful.

Piping plovers were observed during the first survey of May 2 and probably arrived at the lake during the last week in April. Nest initiation dates for the plovers ranged from May 11 to June 20. Both of these dates are notably later compared with first and last initiation dates for 1993 (May 3 and June 11). The first least tern sighting was made on May 24. The earliest tern nest initiation was on June 16. The last nest initiation was between July 15 and July 21. This again was later compared to 1993 when the earliest nest initiation was on June 11.

Fort Peck River: In May 1994 releases from Fort Peck Dam were increased to simulate the natural hydrograph of high spring flows of the Missouri River. These releases averaged 12,000 cubic feet per second (cfs) and resulted in the inundation of nearly all suitable nesting habitat within the reach subsample. Releases were reduced to an average of 8,000 cfs by June 11 and the sandbars and low islands reappeared. The first surveys of the subsample were completed on June 14 and 15. Both species were observed. The birds undoubtedly had arrived earlier for both species had initiated nests on June 7. The latest nest initiation for least terns on the subsample was July 7. The plover nest initiated on June 7 was the only nest discovered in the subsample area.

Lake Sakakawea: Habitat conditions on Lake Sakakawea continued to be dynamic for the 1994 nesting season as Lake Sakakawea returned to normal operational pools after five years of drought. The lake rose from 1837 feet msl in February to a peak of 1845.4 feet msl in late June. Several islands used by the birds during the drought years of 1988 -1992 were totally submerged. A surprisingly large amount of habitat became available as sandy beaches on the shoreline and large islands that previously were hundreds of yards from the lake became waterfront property. The plovers colonized these areas and were highly dispersed around the lake. The terns however were concentrated for the most part at two colonies on the lake.

Surveys of the birds began on Lake Sakakawea on May 24. The plovers however had arrived at least a month earlier as the first nest was initiated the week of April 25. The latest plover nest initiation was on June 20. These dates are both earlier and later compared to 1993 when the earliest initiation was May 3 and the latest was June 17. The terns began arriving in the first two weeks of June though a tern was not seen until June 12. A tern nest was found on May 31 but was subsequently destroyed without the parents being observed. The latest date for a tern nest initiation on the lake was the week of July 11. By comparison the earliest nest initiation for terns in 1993 was June 13 and the latest was July 10.

Garrison River : Releases from the Garrison Dam were increased to an average of 25,000 cfs in mid May to mimic the natural spring runoff of the Missouri River. This flow was held through mid June when releases were reduced to an average of 19,500 cfs. This regime resulted in substantial portions of the terns' and plovers' habitat being inundated during this time period.

Plovers were already in the reach by the time first surveys were conducted the week of May 22. The earliest nest initiation by the plovers was the week of May 16, the latest the week of June 27. By comparison the earliest plover nest initiation in 1993 for this reach was May 8. The first sighting of a least tern on the reach was May 31. The birds had arrived earlier for a nest was initiated on May 27. The latest initiation date for a tern nest was the week of July 10.

Lake Oahe: Like Fort Peck Lake and Lake Sakakawea, Lake Oahe saw a substantial rise in the water level in 1993, going up 15.4 feet. In 1994 the lake peaked at 1611.7 feet msl in April. The lake declined a foot and remained near elevation 1610.5 feet msl throughout the summer. The lake's 1993 rise eliminated most of the habitat for the birds. The northern half of the lake was limited to five nesting sites, the southern half to two sites.

Piping Plovers arrived at Oahe during the last week in April with the earliest nest initiation occurring that week. The latest nest initiation for the plovers was the week of June 20. Least terns were first observed on the lake the last week of May. The earliest nest initiation for terns also occurred at this time. The latest nest initiation for the terns was the week of July 11.

Fort Randall River: Releases from Fort Randall Dam in the late spring and early summer of 1994 took their cue from the downriver Gavins Point Dam. Releases averaged 19,800 cfs in April, 28,000 cfs in May, 25,700 cfs in June and 25,400 cfs in July. Unlike the river reaches below Fort Peck and Garrison Dams, releases out of Fort Randall were not manipulated to simulate a natural hydrograph of high flows due to mountain snowpack melt. However releases from the dam were "spiked" every third day. "Spiking" consisted of a cycle of relatively high releases for one day followed by two days of low releases. The purpose of the spiking was to force the birds to nest at higher locations that would not be subject to flooding.

Historically nesting habitat within the reach is limited to a couple of islands. However these islands are quite large and can support tern colonies. Piping plovers and least terns were observed on this reach during an initial inspection trip conducted on June 7, 1994. Both species had arrived earlier as the earliest plover nest was initiated on May 27 and the earliest tern nest on May 31. These dates represent a week earlier for the plovers

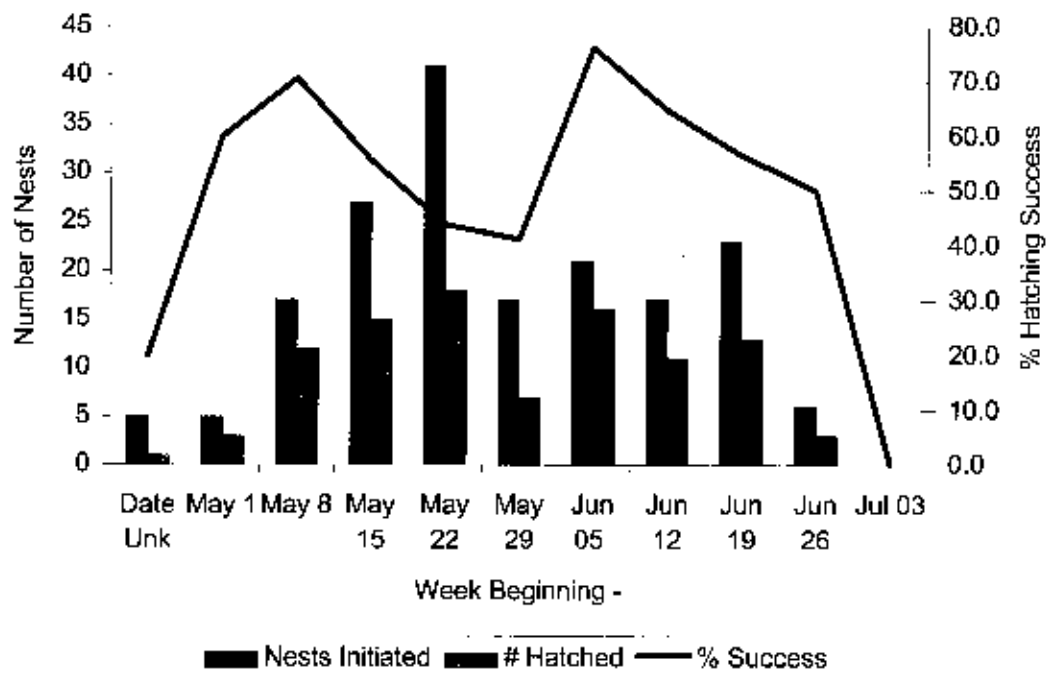
compared to 1993 (June 3) and two weeks earlier for the terns (June 15). The latest date for a plover to initiate a nest was June 27, the latest for a tern was July 18.

Lewis & Clark Lake: Lewis & Clark Lake was targeted for elevation 1206 feet msl throughout the spring and summer of 1994. At this elevation nesting habitat is available for the birds in the upper part of the lake. During April and May the lake fluctuated between 1205.2 to 1206.8 feet msl. Plovers were first observed on Lewis & Clark on May 23 with the earliest nest initiation occurring on May 15. The latest nest initiation for plovers on the lake was June 25. Least tern nests were not found on the lake until June 22. The earliest nest initiation for the terns was June 20, with the latest being July 5.

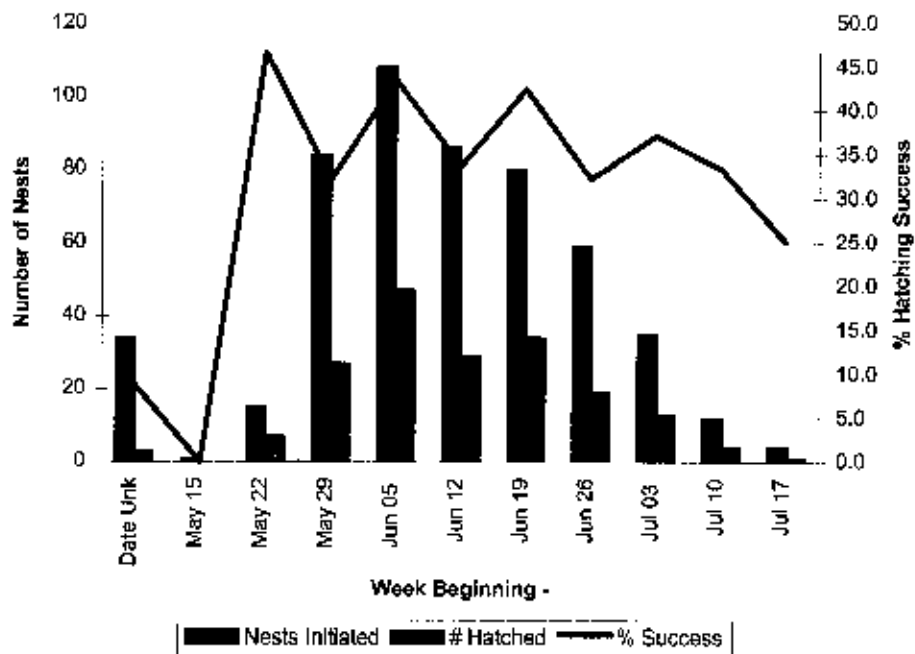
Gavins Point River: Adequate nesting habitat was available for the birds at the beginning of the nesting season for the Missouri River below Gavins Point Dam. Releases from the dam were increased to the summer flow rate of 32,000 cfs on May 3. Piping plovers were first observed on the reach on May 24. The plovers however had arrived much earlier with the earliest nest initiation having occurred on May 9. The latest plover nest initiation was on June 16. Least terns were observed on the reach on May 25. Like the plovers they had arrived earlier than this first observation as the earliest nest initiation for terns was May 19. The latest nest initiation for the terns on the reach was July 15.

The charts on the following page shows by week the nest initiations and nest success for tern and plovers on the Missouri River system in 1994.

Piping Plover Nest Initiation & Nest Success by Week - 1994



Least Tern Nest Initiations & Nest Success by Week- 1994



ADULT CENSUS

The adult census, as in previous years, was conducted during the last week in June and the first week in July. Census activities were conducted with the aid of a boat and binoculars or spotting scope. Adults were counted either while incubating clutches, loafing on the sandbar, or flying overhead near the natal areas. If heavy vegetation existed on an area preventing observation of adults on the ground, sites were entered, causing the birds to flush where they were then counted in the air. On sites with large nesting colonies, where bird activity makes actual counts improbable, the census count was recorded as twice the number of active nests plus the brooding pairs. Date, time, observers, and site location was recorded during entry of each census record. All terns and plovers observed on the Missouri river having adult plumage were recorded as breeding adults.

The dates when the adult census was conducted, by reach, are listed below.

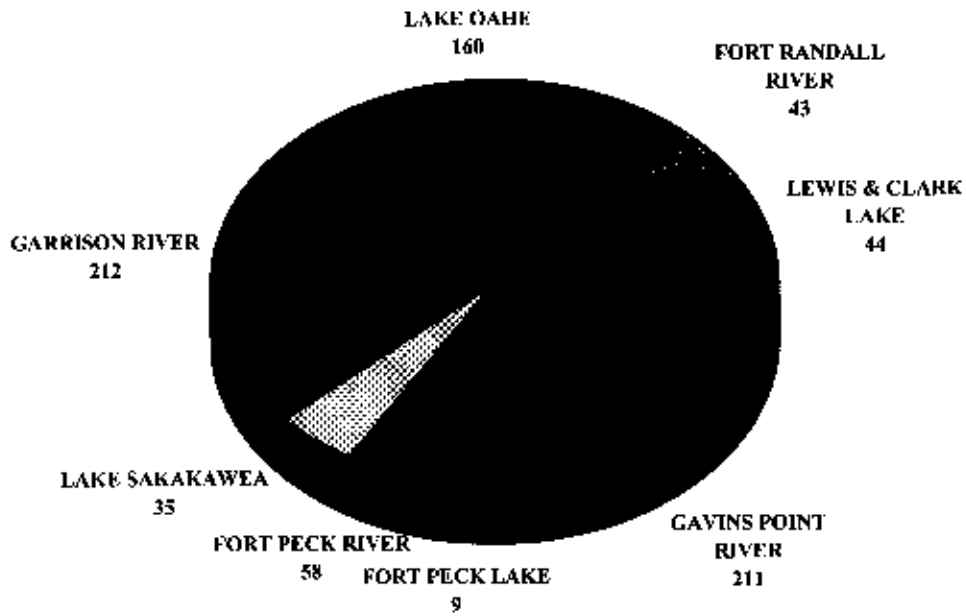
Fort Peck Lake	July 7
Fort Peck River	July 11 - 12
Lake Sakakawea	June 26, 28 - 30, July 1, 7
Garrison River	June 28, 29, July 1
Lake Oahe	June 24, July 6-8
Fort Randall River	June 29
Lewis and Clark Lake	June 28
Gavins Point River	June 27, 29, 30, July 1

The 1994 population distribution of piping plovers and least terns nesting on the Missouri River, remained similar to past years, with Lake Oahe joining the Gavins Point and Garrison River Reaches as supporting the largest concentrations (See Chart Page 28). System wide there were 772 adult least terns and 352 adult piping plovers counted in 1994.

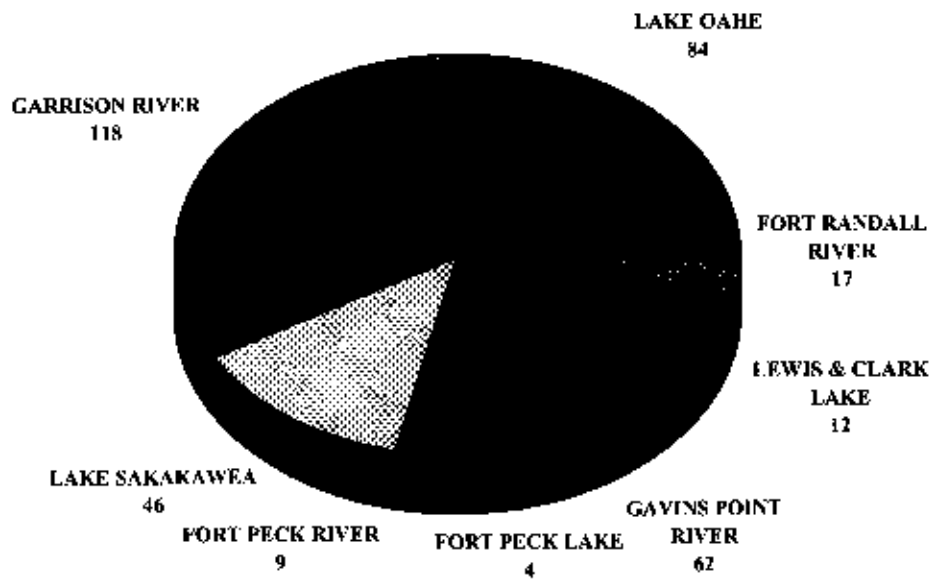
This was the highest count ever for least terns since the census began in 1986. The Lake Sakakawea, Garrison River, and Lake Oahe Reaches all recorded record highs. The 1994 least tern adult census represented an 11% increase (772/696) over the 1993 adult census. Overall the least tern population on the Missouri River system over the last five years may be characterized as stable to rising (See Table Page 29).

Piping plover numbers however declined for the third consecutive year. Plover numbers were down 9% (349/381) compared to 1993 and down 44% compared to 1991's system high of 618 adult birds (See Table Page 29). The decline in plover numbers was most severe in the Lewis & Clark Lake and Gavins Point River Reaches where the population was down 48% (74/141) compared to 1993.

LEAST TERN ADULT CENSUS BY REACH - 1994



PIPING PLOVER ADULT CENSUS BY REACH - 1994



ANNUAL ADULT PIPING PLOVER POPULATION COUNTS, 1986-1994

<u>SURVEY REACH</u>	<u>1994</u>	<u>1993</u>	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>
FORT PECK RESERVOIR	4	30	26	25	22	12	10	10	16
FORT PECK RIVER	9	2	0	13	17	11	5		
LAKE SAKAKAWEA	46	5	108	150	132	57	143		
GARRISON RIVER	118	125	77	121	71	86	113	160	139
FORT RANDALL RIVER	17	12	12	45	31	0	31	16	11
LAKE DAHE	84	66	143	87	88	140	55	4	4
LEWIS & CLARK LAKE	12	32	1	12	11	18	0	0	0
GAVINS POINT RIVER	62	109	111	165	144	122	212	177	172
TOTAL	352	381	478	618	516	446	569	367	342

ANNUAL ADULT LEAST TERN POPULATION COUNTS, 1985-1994

<u>SURVEY REACH</u>	<u>1994</u>	<u>1993</u>	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>
FORT PECK RESERVOIR	9	7	0	10	6	4	3	4	
FORT PECK RIVER	58	31	110	66	92	51	18		
LAKE SAKAKAWEA	35	14	29	8	8	15	7		
GARRISON RIVER	212	135	198	195	174	122	142	175	171
FORT RANDALL RIVER	43	38	20	62	67	4	45	60	25
LAKE DAHE	160	123	124	143	100	97	82	21	16
LEWIS & CLARK LAKE	44	76	22	25	21	29	0	0	0
GAVINS POINT RIVER	211	272	186	193	166	210	252	232	181
TOTAL	772	696	689	702	632	532	549	492	393

PRODUCTIVITY AND RECRUITMENT OF FLIGHTED CHICKS

Productivity monitoring provides a standard of measurement onto which success or failure of implemented management practices can be evaluated. The most critical scale of any recovery effort must be rated with the return gained from annual reproductive efforts or in the recruitment of young to the adult population. No matter how much habitat is created or prudent measures implemented, nothing will recover piping plover and least tern populations unless annual productivity exceeds annual mortality. In light of this, fledge ratio goals (number of juveniles produced annually per pair of breeding adults) were established by the Biological Opinion to give the Corps a target to meet in implementing management activities on the Missouri River. Correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting recovery goals. Every effort was made to accurately collect and report all aspects of the productivity monitoring activities during 1994.

Sites identified, through early habitat use surveys, to contain active nesting colonies were revisited every seven - ten days during the duration of the summer to record nesting activity and chick survival. (The exception to this was on the Fort Peck River Reach where productivity was geographically subsampled.) Active nesting sites were searched to determine the number of nests and principle causative factors responsible for any nest being prematurely terminated. Each colony was searched on foot with the aid of binoculars. Nests were located by observing adult behavior or by doing systematic searches of the colony site. Each nest was identified by placing a numbered wooden tongue depressor within one meter of the nest. Nests were relocated every seven to ten days until the nest was terminated. All on site activity was limited to thirty minutes or less including any passive predator management activities.

Information collected from each nest was recorded on a standardized nest card and included species, number of eggs, stage of incubation-obtained through use of the egg flotation method, nest location, nest initiation date, and nest fate. Cause of nest termination was recorded as hatched or destroyed, with hatched nests being determined by the presence of piping fragments or chick excrement in the nest bowl. A nest was considered successful if it hatched a single egg from the clutch. In a change from 1993, eggs were not identified by writing the nest number on the egg. Destroyed nests were identified to a principle

causative factor including but not limited to, flooding, weather, human disturbance, predation, and abandonment. If a cause could not be determined the nest was listed as destroyed - unknown.

Chick survival was recorded during weekly nest searches of nesting areas. As the breeding season progressed, efforts were concentrated on locating chicks and keeping track of fledged chicks using natal areas. Chicks were typically flushed ahead of observers on the nesting sites and were aged by visual observation of size and primary feather development. Care was taken to prevent chicks from fleeing into the water while escaping from observers.

Chicks were tracked during the fledging period by recording each observation on a chick record portion of the adult census card. Because of a high probability of fledging before the next week's visit twenty-two day old plovers and fifteen day old least terns were considered fledged.

The 1994 breeding season saw a return to a more normal operation of the mainstem dams following the extraordinary flood conditions of 1993. Results of the 1994 production surveys are given for plovers (Table Page 35) and for terns (Table Page 35). See Appendix B for a site by site synopsis of the mainstem system. Productivity by Reach is as follows.

Fort Peck Lake: Least tern nesting was restricted to one beach on the lake where eight nests were found. Three of these nests successfully hatched which resulted in two fledged chicks. One nest was lost to flooding and one was lost to unknown causes. The fate of the other three nests could not be determined but predation by gulls is suspected. The gulls had avoided the site due to the presence of nesting common terns on the beach. Once the common terns left the beach, the gulls occupied the area.

Piping plovers were more widely distributed than terns with nests being found at eight sites around the lake. Only five of the eleven plover nests on the lake successfully hatched and of these, only three chicks from one nest fledged. Predation by gulls may have caused the failure of the other nests. Gulls were often seen cruising the shoreline and the reduced amount of beach habitat may have concentrated the gulls near the plovers. The only successfully fledged chicks came from a beach that was home to a common tern colony.

Fort Peck River: The subsample that was monitored produced five least tern nesting sites; one major colony containing seventeen nests, a colony of three nests, and three single nest sites. Generally the terns were very successful with a nest hatching success of 61% (14/23)

and a fledge ratio of 1.46 (19 fledged chicks/13 pairs of adults). Ten of the fourteen successful nests came from the major colony. Likewise fourteen of the nineteen fledged chicks were from the major colony. Due to the size of the colony and time constraints set forth in the permit, tracking of all the nests could not always be accomplished. Of the seven unsuccessful nests at the colony, one was lost to unknown causes, for three the fate was unknown, and three nests were abandoned.

Piping plover nests were virtually absent from the subsample of the reach. Only one nest was found and this was located at the site of the major tern colony. The fate of this nest was undetermined, as two of the eggs may or may not have hatched.

Lake Sakakawea: Least terns nested at four sites on Lake Sakakawea, two colony sites and two single nest sites. The largest tern colony was in the headwaters area of the lake, about a mile east of the US Highway 85 bridge. This colony contained eleven nests, only one of which had a successful hatching. The other ten nests were lost to unknown causes. The second tern colony was located along the shore of the lake south of Independence Point. This colony contained five nests of which two had successful hatchings. None of the chicks from the three successful nests fledged however.

The piping plovers on Lake Sakakawea were widely distributed across nine nesting sites ranging from the northwest corner of the Van Hook Arm to the eastern shore of Lake Audubon. This may have been the result of former nesting sites such as Sheep Island and Shell Creek Island being inundated by the 1993 and 1994 rises in the lake elevation. The shoreline south of Independence Point, which previously had not been known to harbor plovers, was the site of three plover nests. Nest success for plovers on the lake was very good with a hatching success of 76.5% (13/17). This success may be due to the wide distribution of the nests. Except for two nests located on a small island in the Van Hook Arm, no nests were closer than a half mile to each other. Nesting success translated into fledging success with 28 plover chicks fledging for a fledge ratio of 1.22 chicks per pair of adults.

Garrison River: The Garrison River Reach produced nineteen least tern nesting sites including three major colonies of more than ten nests apiece, seven moderate sized colonies of between five to nine nests, and nine sites of between one to four nests. Nest success was 45.5% (60/132). The two highest categories of nest failure were destroyed unknown (29)

and fate unknown (22) which accounted for 70.8% (51/72) of the nest failures. A total of 66 tern chicks fledged off the reach for a very good fledge ratio of 0.61 (66 chicks/106 adult pairs).

Piping plovers nested at seventeen sites within the Reach. One site contained more than ten nests, three sites had between five to ten nests, and thirteen sites had between one to four nests. The plovers had a very good nest success of 68.6% (35/51). This in turn led to a fledge ratio of 0.99 (57 fledged chicks/58 adult pairs). Nest failures were evenly spread through several causes with abandoned and destroyed unknown being the leading cause at four apiece.

Lake Oahe: The Lake Oahe Reach had a record number of adult terns for the reach and the third highest number of terns of the eight reaches. Unfortunately this did not translate into a production of fledged chicks. Four sites within the reach contained nests with over 76.0% (54/71) being concentrated at one site, Dredge Island, in the northern part of the lake. Another thirteen nests were at a second site and the two remaining sites contained two nests each. Nest success was poor at Dredge Island with only eleven nests hatching. Fate unknown and destroyed unknown accounted for 79.1% (34/43) of the failures. At the thirteen nest colony only one nest had a successful hatching. Flooding from the rising of the lake and destruction from grazing livestock accounted for five nest failures each. Overall only five tern chicks fledged off the Lake Oahe Reach for a poor fledge ratio of 0.06 (5 chicks/80 adult pairs).

The Lake Oahe Reach had the second highest number of piping plovers of the eight reaches, but like the terns this did not translate into fledged chicks. Plover nests were found at six sites on the lake with largest concentration being on Dredge Island 69.7% (23/33). The Reach had a very good nest hatching success at 54.5% (18/33). However only four chicks fledged off the reach, none from Dredge Island. The fledge ratio for the Reach was only 0.10 (4 chicks/42 adult pairs).

Fort Randall River: Least terns nested at two locations with the Fort Randall River Reach, one being a major colony of twenty nests, the other a minor colony of seven nests. Nest success was fairly high with 55.6% (15/27) of the nests hatching eggs. Weather (five) and flooding (four) were the primary causes of nest failures. The nest success however was not replicated in fledge success. No tern chicks from the Reach were known to have fledged.

Piping plovers nested at only one site with the Reach, at the major tern colony. Like the terns the plovers had above average nest success 66.7% (4/6) hatching eggs. However, just like the terns, no plover chicks fledged off of the Reach.

Lewis & Clark Lake: There were 21 Least tern nests located at four sites on Lewis & Clark Lake. This included one colony of ten nests and another of seven nests. Nesting success for the terns was zero on the reach. The ten nest colony was destroyed by predation. The other eleven nests at the three other sites were lost to flooding.

There were ten piping plover nests at five locations on the lake. Four of the five nesting sites contained single nests. The fifth site, was the site of the ten nest least tern colony and contained six nests. These six nests suffered the same fate as the tern colony and all were lost to predation. Only one of the other four plover nests successfully hatched and this nest produced two fledged chicks.

Gavins Point River: In mid June "spiking" of releases from Gavins Point Dam was conducted for a two and half week period. The "spiking," one day of relative high releases followed by two days of flow releases, was done to prevent the birds from nesting too low when releases were reduced due to downriver flooding. Despite this tactic some low lying nests were lost to flooding.

Overall productivity was very good on the reach. A total of 219 least tern nests were found at fourteen sites within the reach. Five of these sites contained more than twenty nests each. Nest success was 34% (75/219). The tern nests were heavily predated with 32% (70/219) being lost. Other nests were lost to flooding (13), weather events (11), abandoned (10), destroyed unknown (14), and fate unknown (21). A total of 51 tern chicks fledged off the reach for a fledge ratio of .48. The plovers nested at eighteen sites within the reach with 51 nests being found. Nest success was 45% (23/51). As with the terns, predation was leading cause for failure for plover nests, accounting for 27% (14/51) of all losses. The heaviest plover nest losses to predators occurred on sites associated with tern colonies. Nineteen plover chicks fledged off the reach for a fledge ratio of 0.61.

UPPER MISSOURI RIVER PIPING PLOVER PRODUCTIVITY MONITORING, 1994.

FTPKRES	11	5	45.5	39	19	0	0	0	0	0	2	0	2	0	2	4	3
FTPKRIV	1	0	0.0	3	0	0	0	0	0	0	0	1	0	0	0	9	0
LKSKRES	17	13	76.5	63	43	3	0	0	0	0	0	1	0	0	0	46	28
GARRIV	51	35	88.6	179	128	0	2	0	1	3	0	4	2	4	4	118	57
LKOHRES	33	18	55.0	124	61	3	0	0	0	0	1	0	9	2	84	4	4
FTRLRIV	6	4	66.7	21	13	0	0	0	0	1	0	1	0	0	17	0	0
LEURES	10	1	10.0	33	4	1	6	1	0	0	0	0	0	1	12	2	2
GAPTRIV	52	23	44.2	177	80	0	15	0	1	2	0	7	2	2	62	19	19
TOTAL	181	99	54.7	639	348	7	23	1	2	8	1	14	15	11	352	113	113

MAINSTEM MISSOURI RIVER LEAST TERN PRODUCTIVITY MONITORING, 1994

FTPKRES	8	3	37.5	14	6	1	0	0	0	0	0	1	3	0	9	4
FTPKRIV	23	14	80.9	46	31	0	0	0	0	0	0	2	3	4	58	19
LKSKRES	18	3	16.7	41	4	0	1	1	0	1	0	11	0	1	35	0
GARRIV	132	60	45.5	270	131	1	3	1	3	10	0	6	45	3	212	86
LKCARRES	71	14	19.7	173	32	5	4	0	0	2	5	2	35	4	180	5
ITRLRIV	27	15	55.5	63	37	4	0	1	0	5	0	1	1	0	43	0
LECLRES	21	0	0.0	32	0	11	10	0	0	0	0	0	0	0	44	0
GAPTRIV	218	75	34.4	514	179	13	89	0	5	11	0	14	21	10	211	51
TOTAL	518	184	35.5	1153	420	35	87	3	8	29	5	37	108	22	772	143

HABITAT MANAGEMENT

Several projects were completed throughout the Missouri River System to maintain and improve existing nesting habitat and to create new habitat. Habitat work on the various reaches is as follows.

Fort Peck Reservoir: No habitat improvement work was done.

Fort Peck River: As in 1993, artificial nesting islands were field tested within the reach's subsample area. Three two unit islands were constructed from six floatable, triangular, plastic units. The ten foot long per side triangles were attached together to form a diamond pattern. The units were towed by boat to natural islands, where they were attached and placed.

The artificial islands were placed at high points on the natural islands. The six inch high artificial islands were buried to a depth of about three to four inches in the natural island substrate (sand). This was done to partially conceal them while allowing them to remain the high point of the island. At least one guy-wire anchor and rope were used to hold the artificial island on site. The anchor and rope were concealed beneath the sand. A mixture of gravel and sand was used to cover the artificial island to a depth of two to three inches. A broad area around the artificial island was also sprinkled with gravel to allow the artificial island to blend in with its surroundings. All human tracks were swept away with a broom.

The purpose of the artificial islands was to provide an attractive high area nesting least terns that would survive flooding. In the event the natural island flooded, the nests and chicks on the artificial island would not be inundated as the artificial nest would float. Likewise chicks that had not hatched on the artificial island could escape to the artificial island if the natural island flooded.

Artificial island #1 was placed on an island at RM 1700.0 on May 26. On June 21 artificial islands #2 and #3 were placed on islands at RM 1688.0 and 1682.8 respectively. Artificial Island #1 was washed out as the river channel eroded out the island it had been placed upon. The anchor was also washed out and the artificial island traveled about 30 feet down river before coming to rest. Much of the gravel had been washed from the surface of the artificial island. This may provide a clue as to how the islands may respond to high

water when they remain anchored in place. In this case, nests or chicks, had they been present on the island, could have been washed into the river. The artificial nest was repositioned on what remained of the natural island.

During the 1994 nesting season there was no documented use of any of the three artificial islands by terns or plovers. It was noted that Canada geese used artificial islands #2 & #3 as resting areas.

Lake Sakakawea: As a part of a four island - one peninsula wetlands complex construction project, a 2.3 acre island is being created to benefit least terns and piping plovers. The complex is being built below Garrison Dam as a joint effort between the Corps of Engineers and the North American Coal/Falkirk Mine Company. The wetlands complex will be the result of restoration work done by the Falkirk Mine following the removal of coal piles that former occupied the site.

Garrison River: Three habitat improvement projects were conducted within the Garrison River Reach in 1994, vegetation removal, oyster shell spreading, and island build up.

1. Vegetation Removal: Portions of four islands were treated with the herbicide Rodco to reduce vegetation. Six acres of vegetation were treated on the island at RM 1371.5, one acre was treated on the island at RM 1369.0, three acres were treated on an island at RM 1300.9, and one and half acres were treated on an island at RM 1299.5.

2. Oyster shell spreading: As part of an eagle scout project, boy scouts spread 150 bags of oyster shells over one acre on an island at RM 1354.5. The oyster shells were spread over selected sandy high spots on the north side of the island. The purpose of the project was to hold the sand in place. Five nests on this island were lost during the 1994 season due to wind blown sand inundation.

3. Island build up: The Cooperative Power Association applied for a Department of the Army Permit to perform a dredging operation in front of their water intake on the Missouri River. Following negotiations between Cooperative Power, the Corps of Engineers, the ND Game & Fish Department, and the ND Health Department it was agreed the spoil material from the project would be placed on an island downriver from the intake at RM 1362.4. The spoil material would be used to build up the island. This in turn would provide habitat for nesting birds during high water discharges from Garrison Dam. The

project was completed in the fall of 1994 and resulted in the island's height being raised from three to five feet.

Lake Oahe: The following habitat improvement projects were completed at Lake Oahe in 1994.

1. RM 1293.0: In late July six acres of vegetation on this island were treated with the herbicide Rodco. In mid August the vegetation was then cut and burned. The island was then disked. The transportation of equipment to the work site was provided by the North Dakota National Guard.

2. RM 1270.0: In late August about 100 six to eight inch DBH cottonwood trees were removed from Dredge Island.

3. Mobridge Area: Habitat work in the Mobridge area consisted of tree removal and vegetative spraying on the Blue Blanket peninsula. This area is a high use spot that in 1994 was less than an acre in size. The area will be mechanically manipulated prior to bird arrival in 1995.

4. Pierre Area: Habitat work in this area was limited to spraying on islands and shorelines to eliminate vegetation. A contract sprayer completed work on September 8, 1994. The work was done utilizing an all terrain vehicle mounted boom and hand held wand. The following sites were treated: Okobojo Creek Island - four acres, Plum/Dry Creek shoreline two acres, Agency Creek shoreline, one acre, and Mission Creek peninsula eight acres. These areas will be mechanically treated to site prep the substrate in the spring prior to May 15 depending on lake elevations.

Fort Randall River: No habitat improvement work was done.

Lewis & Clark Lake: No habitat improvement work was done.

Gavins Point River: In April 1994 a major habitat reconstruction project was completed utilizing Corps of Engineers personnel, the South Dakota National Guard, and a private contractor. Nine sites were selected based on their potential for creating nesting habitat and on their height above the anticipated 1994 flows. Chainsaws and brush hog mowers were used to remove vegetation from nearly 150 acres at these sites. Bulldozers, followed by

tractors pulling discs, were used to cap the areas with unconsolidated sediments to provide vegetation free nesting areas. The project was completed over three weeks and created 118.5 acres of habitat. The project proved to be very successful with over 250 nests being initiated on these sites and sites created in the fall of 1993.

In late July and early August 110 acres of habitat were treated with the herbicide RODEO to prepare the nesting areas for the 1995 nesting season.

OTHER ACTIVITIES AND MANAGEMENT ACTIONS

Predator Aversion

Predator exclosure cages were utilized to increase survivability of piping plover nests. Cages were assembled on site during the time allowed for productivity monitoring activities. Hands were washed with no scent soap prior to the handling of any cage components. Cages used on the Lake Sakakawea, Garrison River, and Lake Oahe were constructed of 2" X 4" welded wire mesh and held in place with electric fence t-posts. Assembly and installation time was approximately five minutes. Cages used on Lewis & Clark Lake and Gavins Point River were constructed of 2" X 2" welded wire mesh and held in place by six 14" wire hook stakes, assembly and installation time was similar. After cage installation the nest was monitored to ensure that the nesting adult returned to the nest. No apparent avoidance of caged nests by piping plovers was detected.

Piping plover nest cages were used to various degrees on five of the eight reaches. (Cages were not used on the Fort Peck Reservoir, Fort Peck River, and Fort Randall River Reaches.) Overall 48% (87/180) of the piping plover nests on the Missouri River System were caged. Excluding the three reaches where cages were not used the figure rises to 54% (87/162). There are several reasons why cages were not placed over every plover nest. In some cases it was not possible to place a cage due to the proximity of vegetation or other features next to the nest. Cages were not placed over nests where the eggs were pipping or already hatched. On several occasions cages were not available when the nest was discovered.

In general, nests that were caged had a higher survivability - 59% (51/87), than uncaged nests - 52% (48/93). The survivability of uncaged nests in the five reaches where

cages were used was not significantly different - 52% (39/75), than in the three reaches where cages were not used - 50% (9/18). Using cages increased survivability in four of the five reaches that employed cages. The sole exception was Lake Oahe where the survivability of uncaged nests was 74% (20/27), compared to 63% (15/24), for caged nests. Results of cage use during 1994 by reach are listed below (See Table Page 41).

Strobe light systems were again used in 1994 to deter nocturnal ocular dependent predators. Strobe light systems were set up at least tern colony sites at River Miles 804.6, 803.8, 802.7, and 799.2 on the Gavins Point River Reach and at Dredge Island (RM 1270) in Lake Oahe. The strobe light systems were highly successful on the four sites in the Gavins Point Reach. Least tern nest success was 69% (46/67) and piping plover nest success was 100% (8/8). By comparison least tern nest success for non strobe light sites was only 19% (29/152). The strobe light system was not as successful for least terns at Dredge Island in Lake Oahe. Nest success was only 21% (11/52). However at non strobe light sites on Lake Oahe tern nest success was worse with only 16% (3/19) nests having a successful hatch. The piping plover nests on Dredge Island covered by the strobe system showed a 61% (11/18) hatching success. Overall, the five sites equipped with the strobe light system showed a 48% (57/119) nest hatching success for least terns and a 73% (19/26) nest hatching success for piping plovers (See Table Page 41).

MAINSTEM MISSOURI RIVER PIPING PLOVER NEST CAGE SUCCESS, 1994

STATION	NO. OF NESTS	NO. OF EGGS	NO. OF CHICKS	NO. OF ADULTS	NO. OF NESTS	NO. OF EGGS	NO. OF CHICKS	NO. OF ADULTS	NO. OF NESTS
---------	--------------	-------------	---------------	---------------	--------------	-------------	---------------	---------------	--------------

FTPKRES	11	5	45.5	11	5	45.5	0	0	0
FTPKRIV	1	0	0.0	1	0	0.0	0	0	0
LKSKRES	17	13	76.5	7	5	71.4	10	8	80.0
GARRIV	51	35	68.6	27	20	74.1	24	15	62.5
LKOHRES	33	18	54.5	15	6	40.0	18	12	66.7
FTRLRIV	6	4	66.7	6	4	66.7	0	0	0
LECLRES	10	1	10.0	4	0	0.0	6	1	16.7
GAPTRIV	51	23	45.1	22	8	36.4	29	15	51.7
TOTAL	180	99	55.0	93	48	51.6	87	51	58.6

MISSOURI RIVER STROBE LIGHTS SITES, 1994

STATION	NO. OF NESTS	NO. OF EGGS	NO. OF CHICKS	NO. OF ADULTS	NO. OF NESTS	NO. OF EGGS	NO. OF CHICKS	NO. OF ADULTS	NO. OF NESTS
---------	--------------	-------------	---------------	---------------	--------------	-------------	---------------	---------------	--------------

OAHERES	1270.0	DREDGE IS.	52	11	21.2	18	11	61.1	
GAVPTRIV	804.6		11	9	81.8	5	5	100.0	
	803.8		12	9	75.0	0	0	0.0	
	802.7		21	14	66.7	2	2	100.0	
	799.2		23	14	60.9	1	1	100.0	
GP TOTAL			67	46	68.7	8	8	100.0	
TOTAL			119	57	47.9	26	19	73.1	

At Dredge Island in Lake Oahe different combinations of predator aversion measures were employed. There were a total of 23 piping plover nests on the island in 1994. Four combinations were utilized; not caged and not within the strobe light system (NC-NS), caged and not within the strobe light system (C-NS), not caged and within the strobe light system, (NC-S), and caged and within strobe light system (C-S). The results are in the table below.

	# of Nests	# Nests Hatched	% Hatched
NC-NS	1	1	100%
C-NS	4	2	50%
NC-S	7	3	43%
C-S	11	8	73%
TOTAL	23	16	70%

Discounting the one nest where no protection measures were employed, the most productive measure was caging a nest within the strobe light system.

Predator Removal

Predator removal was accomplished at one site on Lake Sakakawea. A fox was observed on an island in the Van Hook Arm where plovers had established a nest and where terns had been seen along the shoreline. An interagency agreement was developed with the North Dakota USDA Animal Control Unit and the fox was removed by a government trapper.

Nest Relocation

One piping plover nest on the Gavins Point Reach was relocated due to bank erosion threatening the nest.

Specimen Collection for Contaminate Analysis

A total of seventeen tern eggs, six piping plover eggs, one adult tern, one adult plover and three plover chicks were collected during field activities and forwarded to respective federal contaminate labs for analysis.

Global Positioning System

A global positioning system (GPS) network was set up on the Gavins Point Reach in the fall of 1994. The network extends from RM 810.5 to RM 754.0 and consists of 48 stations. This GPS network will be used for island mapping, geomorphological studies, nest locations, and nest elevations.

Yellowstone River Least Tern & Piping Plover Study

A two year study of least terns and piping plovers on the Yellowstone River began in the spring of 1994. The Yellowstone River in central Montana provides a unique opportunity to study the chronology of least tern and the piping plover nesting and reproductive success on a near natural free-flowing river system. The study, which is being conducted by a graduate student from Montana State University, will investigate the responses of least terns and piping plovers to a natural river hydrograph and develop a scientific database. This database will assist in determining future big river system operations that may impact the two species.

Thank you to the following people and their crew of dedicated staff who have diligently conducted the surveys, compiled the data, and submitted the annual field report.

MR. GORDON WARRICK - FTPKRES and FTPKRIV

MR. GREG PAVELKA - LKSKRES

Mr. LEROY PHILLIPS - GARRRIV

MR. BILL MAY - GARRRIV and LKOARES

MS. TERRI THOMAS - LKOARES

MR. JIM SUEDKAMP - LKOARES

MR. MERRITT STEGMEIER - FTRLRIV

STAFF OF LEWIS AND CLARK LAKE

Casey D. Kruse

Wildlife Biologist/Field Coordinator

MISSOURI RIVER
INTERIOR LEAST TERN AND PIPING PLOVER
POPULATION STATUS AND PRODUCTIVITY SUMMARY

including
Permit Activity Report



*.....Learning today
Knowledge tommorrow.....*



**US Army Corps
of Engineers**
Omaha District

DECEMBER 1995

1995 AT-A-GLANCE

INTERIOR LEAST TERN (STERNA ANTILLARIUM)

Missouri River Population Survey & Productivity Monitoring

	ADULT CENSUS	MONITORED ADULT CEN	NESTS	NESTS HATCHED	SUCCESS RATIO	EGGS	AVE CLUTCH SIZE	EGGS HATCHED	MONITORED CHICKS FLEDGED	TOTAL CHICKS FLEDGED	FLEDGE RATIO	COLLECTED NESTS	COLLECTED EGGS	COLLECTED FLEDGED
Fort Peck Lake (FTPKRES)	2	2	5	0	0.0	6	1.20	0	0	0	0.00	0	0	0
Fort Peck River (FTPKRIV)	95	43	31*	20*	64.5*	76*	2.45*	51*	21	47**	0.98	0	0	0
Lake Sakakawea (LKSKRES)	7	7	2	0	0.0	5	2.50	0	0	0	0.00	0	0	0
Garrison River (GARRRIV)	348	348	159	72	45.3	407	2.56	189	126	126	0.72	15	28	13
Lake Oahe (LKOHRIS)	93	93	35	13	37.1	78	2.23	31	0	0	0.00	0	0	0
Fort Randall River (FTRLRIV)	10	10	26	0	0.0	32	1.23	0	0	0	0.00	11	17	9
Lewis and Clark L (LECLRES)	18	16	17	0	0.0	31	1.82	0	0	0	0.00	12	23	6
Gavins Point River (GAPTRIV)	93	93	118	26	22.0	253	2.14	57	23	23	0.49	42	92	50
TOTAL	664	642	393	131	33.3	868	2.26	326	170	196	0.59	80	160	78

a = Nests per 100 attempts

b = fledged chicks per pair of adult birds (Does not include collected fledged.)

* = Numbers represent monitored Reach subsample

** = Fledge Ratio x Adult Census Pairs

1995 AT-A-GLANCE

PIPING PLOVER (*CHARADRIUS MELODUS*)

Missouri River Population Survey & Productivity Monitoring

	5	5	10	2	20.0	31	3.10	7	3	3	1.20	0	0	0	0
Fort Peck Lake (FTPKRES)	20	4	3*	3*	100.0*	11*	3.67*	8*	7	35**	3.50	0	0	0	0
Fort Peck River (FTPKRIV)	24	24	42	5	11.9	145	3.45	14	0	0	0.00	14	51	0	44
Lake Sakakawea (LKSRES)	287	287	136	65	62.5	497	3.65	269	122	122	0.85	14	40	9	33
Garrison River (GARRRIV)	34	34	21	7	25.0	68	3.24	22	14	14	0.82	3	8	0	4
Lake Oahe (LKORES)	0	0	7	0	0.0	9	1.29	0	0	0	0.00	0	0	0	0
Fort Randall River (FTRLRIV)	4	4	3	0	0.0	8	2.00	0	0	0	0.00	2	5	0	4
Lewis and Clark L. (LECLRES)	63	63	56	9	16.1	189	3.36	28	5	5	0.16	28	93	7	76
Gavins Point River (GAPTRIV)															
TOTAL	437	421	278	111	39.9	956	3.44	368	151	179	0.82	61	197	16	161

a = Nests per 100 attempts

b = fledged chicks per pair of adult birds (Does not include collected fledgling.)

* = Numbers represent monitored Reach subsample

** = Fledge Ratio x Adult Census Pairs

TABLE OF CONTENTS

Introduction	1
Designated Study Areas	3
Reach Descriptions & Historical Backgrounds	7
Initial Habitat Observations & Nest Initiations	20
Adult Census	24
Productivity & Recruitment of Flighted Chicks	28
Habitat Management	35
Management Actions	36
Predator Aversion	36
Predator Removal	38
Sign Posting & Fencing	38
Nest Relocation	39
Chick Relocation	40
Berm or Island Building	41
Specimen Collection	42
Captive Rearing Program	42

SUBJECT: U.S. Army Corps of Engineers annual report on the Missouri River interior least tern (*Sterna antillarum*) and piping plover (*Charadrius melodus*) population status and productivity including activities conducted under endangered species research permit PRT-704930, subpermit 93-07.

PURPOSE: This report is intended to provide annual trend data on the adult populations and production estimates of least terns and piping plovers nesting along monitored reaches of the mainstem Missouri River during 1995. Efforts have been made to standardize data presentation in this report so that comparisons can be made with previous data collected on these reaches. All activities and procedures used to collect this data during the 1995 nesting season are discussed within this document. This report represents compiled data from eight U.S. Army Corps of Engineers Project and Natural Resource Offices, a contracted U.S. Fish and Wildlife Service-Ecological Services Office, and a contracted tribal fish and wildlife agency. If procedural information in greater detail than what is presented herewithin is required for comparative studies, unassimilated field office reports are available from the Operations Division of the Omaha District, U.S. Army Corps of Engineers, 215 North 17th Street, Omaha, NE 68102-4978.

INTRODUCTION

The U.S. Army Corps of Engineers (Corps) received a jeopardy Biological Opinion on the operations of the Missouri River Main-stem System from the U.S. Fish and Wildlife Service (USFWS) on November 14, 1990. This Biological Opinion (Opinion) concluded that the operations of the Missouri River would likely jeopardize the continued existence of the interior population of the least tern (*Sterna antillarum*) and the Great Plains population of the piping plover (*Charadrius melodus*). The least tern was listed as state and federally endangered in 1985. The piping plover was listed as state and federally threatened also in 1985.

The Opinion included Reasonable and Prudent Measures, Reasonable and Prudent Alternatives, and Conservation Measures that, if implemented, would preclude jeopardy to these species. The preclusion of jeopardy was based on production to be measured by fledge ratios of least terns and piping plovers on the Missouri River. Implementation of recovery measures is to be monitored through annual breeding adult population censuses and productivity surveys. Once productivity standards are achieved they will be maintained and monitored for ten consecutive years.

During the period from 1986-89 the Corps, in anticipation of an Opinion, began funding a series of studies to determine the population distribution of least terns and piping plovers throughout the Missouri River basin, and to determine factors influencing the decline of these species. Based on findings of these studies, measures were initiated to reduce the impacts of human recreation on nesting areas and water release hydrographs were developed to prevent flooding of nests and pre-fledged chicks.

Upon receiving the Opinion in 1990, the Corps intensified efforts to gather life history data and vital rates of piping plovers and least terns nesting on the Missouri River. Universities and the USFWS were contracted to collect this information during a second series of studies. Further measures, resulting from these continuing studies, have been developed and are currently being implemented to deter predation on the nesting colonies, to better control the inundation of low elevation nesting sites, and to retard the loss of habitat due to vegetation encroachment.

The 1995 nesting season represented the third year of an effort by the Corps to conduct the survey and monitoring activities and to become actively involved from the field perspective in the recovery of these two species. Corps staff from five Project Offices and three Natural Resource Offices were involved on seven of eight designated reaches of the Missouri River, conducting adult population surveys and productivity monitoring of nesting sites along nearly 850 miles of river and reservoir shoreline. In addition, the Corps provided funding for scope-of-work contracts with the USFWS-Montana Ecological Services field office and the Cheyenne River Sioux Tribal Fish and Wildlife Agency, which surveyed and monitored an additional reach and part of a second involving 60 river miles.

Data collection was standardized through the development and use of basin wide data cards for nest sites, adult surveys, and chick observations (See Appendix A for examples of nest cards and adult census cards). A guidelines manual for field personnel to use during piping plover and least tern survey and monitoring activities was utilized during the field season. Training sessions covering proper field techniques, chick identification, juvenile aging, permit compliance, and record keeping were held for all staff involved with either the adult surveys or the productivity monitoring.

All work was conducted in compliance with the conditions of the endangered species research permit (Regional Blanket Permit PRT-704930, subpermit 93-07) issued to the U.S. Army Corps of Engineers, Omaha District, Omaha, Nebraska, by the USFWS's Denver Regional Office to work on least terns and piping plovers within the Missouri River Basin during 1995, and with authorization of represented state game and fish departments. Contracted agencies were individually permitted.

DESIGNATED STUDY AREAS

Study development included designating eight reaches historically identified as plover and tern nesting areas within the mainstem Missouri River, to be used as management units. These reaches were selected based on geographic location, hydrographic characteristics, and the ability to control or influence water elevations through dam releases.

These eight management units include four riverine or lotic reaches and four reservoir reaches. Project or field office responsibilities for adult censuses and productivity monitoring was determined by proximity to the given reach.

In a change from 1994, the Corps of Engineers' Fort Peck Project assumed adult census and productivity monitoring on the Fort Peck River Reach from the U.S. Fish & Wildlife Service. Also a new subsample of the Fort Peck River Reach was monitored in 1995. The Corps' Garrison Project's Williston Resource Office conducted the adult census and productivity monitoring on the Missouri from River Mile (RM) 1581.4 to 1568.1.

Management reaches, agency and office conducting the surveys and monitoring activities during 1995, and inclusive river miles of survey and productivity subsample are listed on the following page.

FORT PECK RESERVOIR (FTPKRES)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Project, Fort Peck, Montana

Adult Census: River Miles 1785.0-1771.0

Productivity: River Miles 1785.0-1771.0

MISSOURI RIVER BELOW FORT PECK RESERVOIR (FTPKRIV)

Corps Fort Peck Project, Fort Peck, Montana

Adult Census: River Miles 1770.9-1581.5

Productivity: River Miles 1714.0-1673.0

Corps Garrison Project Williston Resource Office, Williston, ND

Adult Census: River Miles 1581.4-1568.1

Productivity: River Miles 1581.4-1568.1

LAKE SAKAKAWEA RESERVOIR (LKSKRES)

Corps Garrison Project Williston Resource Office, Williston, ND

Adult Census: River Miles 1568.0-1480.5

Productivity: River Miles 1568.0-1480.5

Corps Garrison Project Riverdale Resource Office, Riverdale, ND

Adult Census: River Miles 1480.4-1389.6

Productivity: River Miles 1480.4-1389.6

MISSOURI RIVER BELOW LAKE SAKAKAWEA RESERVOIR (GARRRIV)

Corps Garrison Project Riverdale Resource Office, Riverdale, ND

Adult Census: River Miles 1389.2-1355.1

Productivity: River Miles 1389.2-1355.1

Corps Oahe Project Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1355.0-1299.1

Productivity: River Miles 1355.0-1299.1

LAKE OAHE RESERVOIR (LKOHRRES)

Corps Oahe Project Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1299.0-1232.0

Productivity: River Miles 1299.0-1232.0

Corps Oahe Project Mobridge Resource Office, Mobridge, SD

Adult Census: River Miles 1231.5-1165.1

Productivity: River Miles 1231.5-1165.1

Corps Oahe Project Pierre Resource Office, Pierre, SD

Adult Census: River Miles 1165.0-1072.0

Productivity: River Miles 1165.0-1072.0

Cheyenne River Sioux Tribe, Cheyenne Sioux Reservation, SD

Adult Census: River Miles 1187.0 - 1110.0

MISSOURI RIVER BELOW FORT RANDALL DAM (FTRLRIV)

Corps Fort Randall Project Office, Pickstown, SD

Adult Census: River Miles 880.0-845.0

Productivity: River Miles 880.0-845.0

LEWIS AND CLARK RESERVOIR (LECLRES)

Corps Gavins Point Project Office, Yankton, SD

Adult Census: River Miles 845.0-811.0

Productivity: River Miles 845.0-811.0

MISSOURI RIVER BELOW GAVINS POINT DAM (GAPTRIV)

Corps Gavins Point Project Office, Yankton, SD

Adult Census: River Miles 811.0-750.0

Productivity: River Miles 811.0-750.0

On the following page is a map of the study areas.

An important function of this reach is its service as a corridor to provide water for the Missouri River navigation channel. The navigation channel extends from Sioux City, Iowa (river mile 732.3) to the confluence of the Missouri and Mississippi Rivers (river mile 0.0) just north of St. Louis, Missouri. Normally the navigation season on the Missouri runs for eight months, from April 1 to December 1. The season can be lengthened or shortened depending upon ice conditions on the river, water storage in the mainstem reservoirs, and water inflows from tributaries downriver from Gavins Point. To provide for minimum navigation service, releases from Gavins Point Dam must average 24,800 cfs in May, 24,000 cfs in June, 26,700 cfs in July, and 28,200 cfs in August. For full navigation service, releases must average 30,800 cfs in May, 30,000 cfs in June, 32,700 cfs in July, and 34,200 cfs in August.

INITIAL HABITAT OBSERVATIONS & NEST INITIATIONS

Habitat use surveys to locate active nesting colonies and nest sites for monitoring purposes were conducted from May to July on the reaches. Surveys were conducted with the aid of binoculars or spotting scope. Potential nesting areas were typically observed from a boat. Large islands or beach areas accessible from land were searched on foot using bird behavior to indicate active nesting colonies. Sites found to have terns or plovers actively exhibiting nesting or courting behavior were recorded on U.S. Army Corps of Engineers aerial mosaic maps (Appendix C) and monitored during production surveys. Initial habitat conditions and nest initiations on the reaches are as follows.

Fort Peck Lake: The lake elevation of Fort Peck Lake on April 1, 1995 stood at 2231.5 feet msl, 5.4 feet lower than on May 1, 1994. This exposed more potential habitat for the two species compared to the previous year. However throughout the nesting season the lake steadily came up, rising to 2244.0 feet by late July. As a result of this 12.5 foot rise several of beaches used by the nesting birds were inundated.

Piping plovers were observed during the first survey of May 2 and probably arrived at the lake during the last week in April. Nest initiation dates for the plovers ranged from May 10 to June 5. The first least tern sighting was made during the week of June 4. The earliest tern nest initiation for the terns was on June 12 with the last occurring on June 16.

Fort Peck River: Releases out of Fort Peck Dam were increased to 7,000 cfs at the beginning of May and were maintained at that level through early August. This left

adequate amounts of habitat available for the birds when they arrived in the spring. The first survey of the west subsample were completed on June 6 with both species being observed. The terns undoubtedly had arrived earlier for a tern nest was initiated on June 1.

The latest nest initiation for least terns on the west subsample was June 27. For the west subsample the earliest plover nest was initiated on June 7, the latest on July 1.

On the east subsample the first survey was completed on May 9. Neither species was seen that day or during others surveys in May. Due to high flows from the Yellowstone River that flooded all habitat in the subsample, surveys were suspended until July when the river flows fell. A least tern colony was discovered on July 20. The earliest nest initiation for this colony was July 10, with the latest occurring on July 14.

Lake Sakakawea: Habitat conditions on Lake Sakakawea proved to be deleterious for the terns and plovers during the 1995 nesting season. The lake rose from 1835.2 feet mean sea level (msl) in February to a peak of 1851.9 feet msl in August. The August peak was the second highest on record for Lake Sakakawea. Though plenty of habitat was available for the birds in May the continued rising of the lake from May through August inundated almost all of the beach habitat used by the birds within the reach.

Surveys of the birds began on Lake Sakakawea on May 3 and piping plovers were found at two locations. Plover nests were initiated on the lake from the first week in May through the second week in June. Egg hatching for the plovers began as early as June 10. Least terns were not observed on the reach until June 3. The earliest nest initiation by a tern on the reach was the first week in June. The latest nest initiation was the first week of July.

Garrison River: The plan to again mimic the natural hydrograph of the Missouri River by increasing releases from Garrison Dam in May and then decreasing flows in June was canceled due to flooding in South Dakota, Nebraska, and Missouri. Instead releases were reduced to diminish the flood threat in the lower basin. In May releases averaged around 13,000 cfs, in June around 11,000 cfs, and around 13,000 cfs in July. Normal releases throughout the summer average around 24,000 cfs. The reduced releases left exposed many sandbars and beaches that are normally submerged, greatly increasing the amount of habitat for the two species. This fortuitous circumstance ended in late July. High water levels on Lake Sakakawea required an increase in releases from Garrison Dam. Releases from Garrison were gradually increased to a peak average of 37,000 cfs by mid August. This effectively ended the nesting season on the reach by eliminating most of the habitat in the reach.

Monitoring on this reach began on May 10 but no terns or plovers were observed. However the plovers were already in the area for it was later determined that two plover nests were initiated the week of May 7. Two plovers and five terns were observed on May 16 and the two species were regularly encountered throughout the rest of the monitoring period. Nest initiation for the terns began the week of May 21. The latest initiation of a plover nest within the reach occurred the week of June 25. The latest nest initiation for a tern nest was the week of July 16.

Lake Oahe: Flooding in the Missouri River's lower basin severely impacted habitat availability on Lake Oahe. To reduce flooding, releases from Oahe Dam were reduced to a record low average of 1,900 cfs for May and an average of 11,100 cfs for June. As a result Lake Oahe rose to a record level of 1618.6 feet msl in June. This rise inundated most of the beach habitat on the lake, leaving very little for the terns and plovers.

Piping Plovers were first observed at Lake Oahe during the second week of May. This same week saw the earliest nest initiations by the plovers. The latest nest initiation for the plovers was the week of June 12. Least terns were first observed on the lake during the first week of May. The earliest nest initiation for terns however did not occur until the first week in June. The latest nest initiation for the terns was the week of July 26.

Fort Randall River: Releases from Fort Randall Dam paralleled the downriver Gavins Point Dam. In the spring and early summer water was held back due to flooding in the lower Missouri River Basin. Releases averaged 10,600 cfs in April, 9,300 cfs in May, 24,700 cfs in June and 32,300 cfs in July. These releases initially left good beach habitat available along the few sandbars found within the reach.

Piping plovers were first observed on May 3 during the initial survey of the reach. Least terns were first seen on the reach on May 23. The plovers nest initiation dates represented a narrow band with the earliest occurring on June 4 and the latest on June 6. Least tern nest initiations occurred between June 6 and June 20.

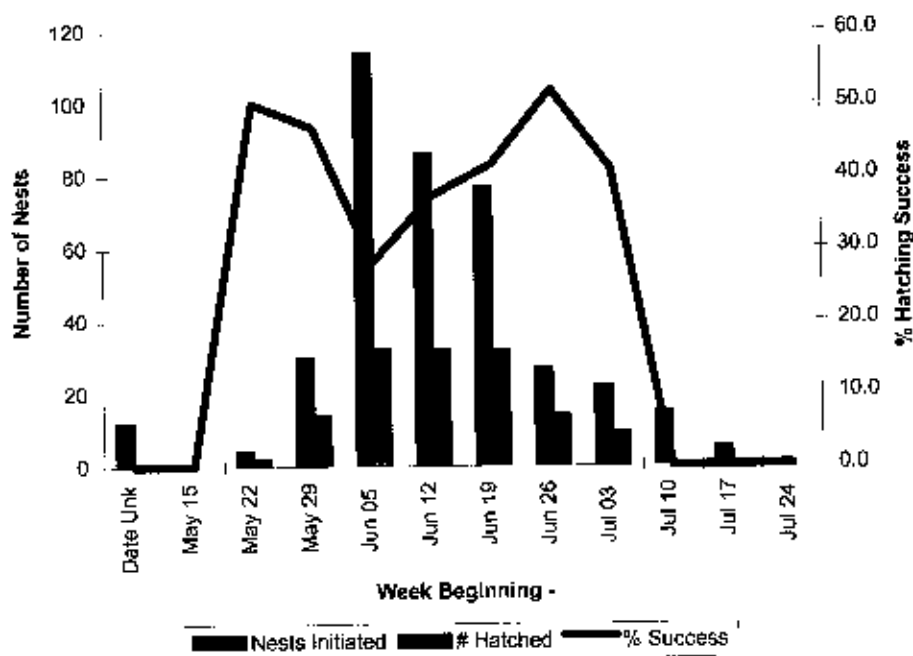
Lewis & Clark Lake: The lake elevation for Lewis & Clark Lake was targeted for 1206 feet msl for the spring and summer of 1995. This level could not be maintained as the May runoff into the river between Fort Randall Dam and Lewis & Clark was the highest on record. Consequently the lake rose to 1209.53 and came within half a foot overtopping the spillway gates of Gavins Point Dam. This eliminated a good portion of the habitat in May.

The lake was drawn down to 1206 feet msl in early June and maintained at that level through July.

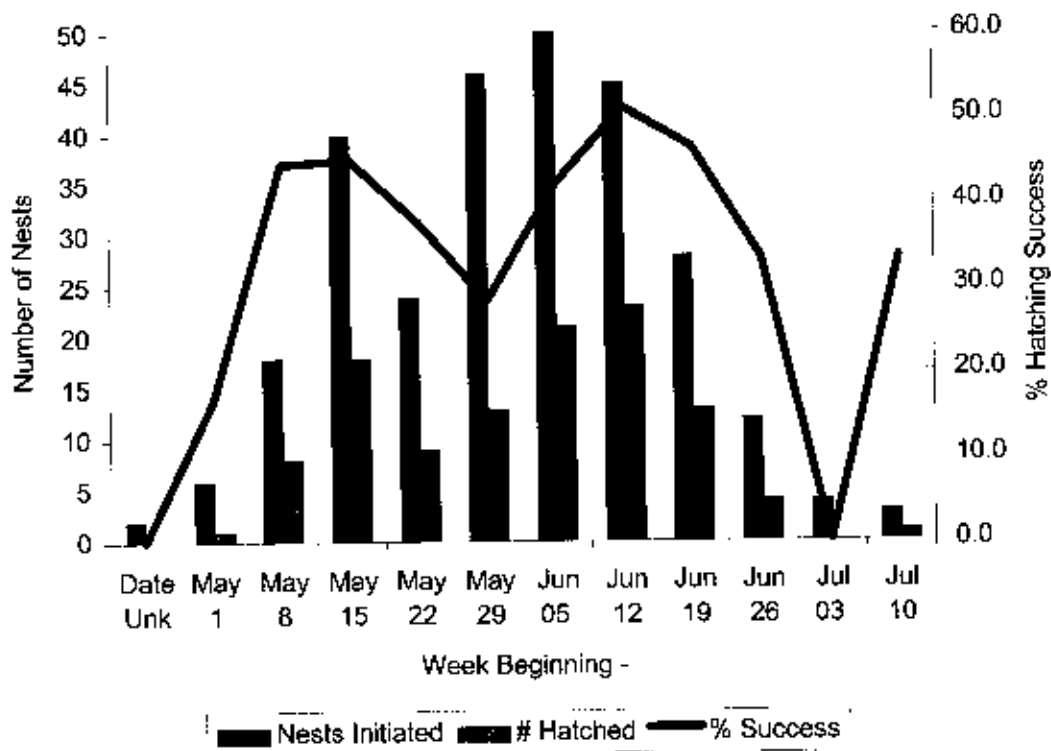
Due to the high lake level the first survey was not conducted until May 30. A pair of plovers were seen that day. Terns were on the lake as early as June 4, the date of the first known nest initiation. The earliest nest initiation for plovers on Lewis Clark was May 30, with the latest occurring on June 23. Terns nested as late as June 25 on the lake.

Gavins Point River: Releases from Gavins Point Dam were kept well below normal during the months of April, May, and June due to high inflows into the Missouri River Basin below the dam. Releases from the dam averaged 17,400 cfs in April and 18,500 cfs in May. As a result large areas of natural and created beach habitat were available for the birds when they arrived at the reach. Piping plovers returned to the Gavins Point Reach in late April. The earliest known nest initiation for the plovers on the reach was May 8. The latest nest initiation for the plovers was July 3. The least terns began showing up in the reach in late May. The earliest recorded tern nest initiation was May 29. The latest tern nest initiation on the reach was July 17. See the following charts for weekly nest initiations and nest successes for least terns and piping plovers on the Missouri River System for 1995.

Least Tern Nest Initiation & Nest Success by Week - 1995



Piping Plover Nest Initiation & Nest Success by Week - 1995



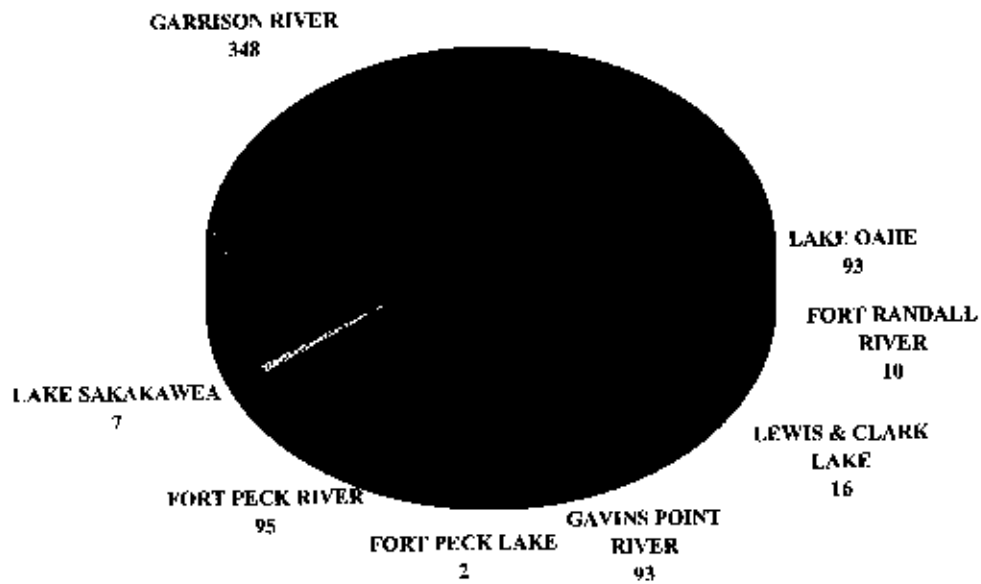
ADULT CENSUS

The adult census, as in previous years, was conducted during the last week in June and the first week in July. Census activities were conducted with the aid of a boat and binoculars or spotting scope. Adults were counted either while incubating clutches, loafing on the sandbar, or flying overhead near the natal areas. If heavy vegetation existed on an area preventing observation of adults on the ground, sites were entered, causing the birds to flush where they were then counted in the air. On sites with large nesting colonies, where bird activity makes actual counts improbable, the census count was recorded as twice the number of active nests plus the brooding pairs. Date, time, observers, and site location was recorded during entry of each census record. All terns and plovers observed on the Missouri river having adult plumage were recorded as breeding adults. The dates when the adult census was conducted, by reach, are listed on the following page.

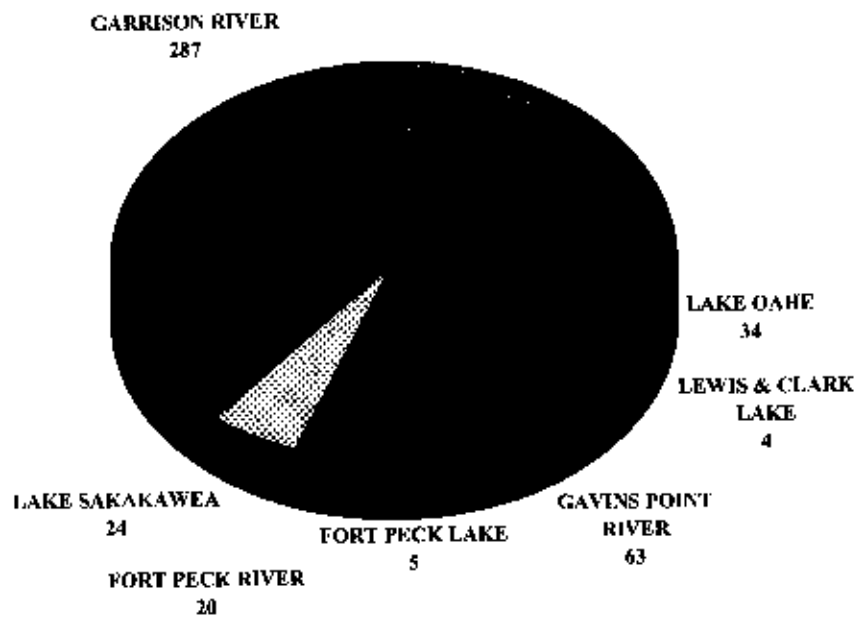
Fort Peck Lake	June 28
Fort Peck River	June 29, July 3-7
Lake Sakakawea	June 25, 26, 29, July 1-3, 6
Garrison River	June 23, 25-27, 29, 30
Lake Oahe	June 29-30, July 1-2
Fort Randall River	June 26
Lewis and Clark Lake	June 26
Gavins Point River	June 27-29, July 6

The 1995 adult census for the Missouri River showed an increase in piping plover numbers for the first time in four years and a modest decline in least tern numbers. The adult census showed 437 plovers and 663 terns within the system, an increase of 24% (437/352) for the plovers and a decline of 14% (663/772) for the terns. The overall numbers however do not reflect the dynamic changes which occurred in the system in 1995. The majority of birds for both species were found on one reach, the Garrison River. Nearly two thirds of all plovers in the system (66% 287/437) and little over half of all terns (52% 348/663) were located within the reach. Both counts were record numbers for the Garrison Reach and were the highest counts ever recorded for any reach within the system. The high numbers were most likely the result of low releases from Garrison Dam during the summer. The low releases exposed large areas of sandbars and beaches on the river that the birds favor. Also high water levels on Lakes Sakakawea and Oahe that eliminated habitat on those two reaches may have moved the birds to the Garrison Reach. The pie charts on page 26 show the results of the adult census by reach for the terns and plovers. The tables on page 27 shows the adult censuses for piping plovers and least terns from 1986 to 1995.

LEAST TERN ADULT CENSUS BY REACH - 1995



PIPING PLOVER ADULT CENSUS BY REACH - 1995



ANNUAL ADULT PIPING PLOVER POPULATION COUNTS, 1986-1995

<u>SURVEY REACH</u>	<u>1985</u>	<u>1994</u>	<u>1993</u>	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>
FORT PECK RESERVOIR	5	4	30	26	25	22	12	10	10	16
FORT PECK RIVER	20	9	2	0	13	17	11	5		
LAKE SAKAKAWEA	24	46	5	108	150	132	57	143	160	139
GARRISON RIVER	287	118	125	77	121	71	86	113	16	11
FORT RANDALL RIVER	0	17	12	12	45	31	0	31	4	4
LAKE OAHIE	34	84	66	143	87	88	140	55	0	0
LEWIS & CLARK LAKE	4	12	32	1	12	11	18	0	0	172
GAVINS POINT RIVER	63	62	109	111	165	144	122	212	177	
TOTAL	437	352	381	478	618	516	446	569	367	342

ANNUAL ADULT LEAST TERN POPULATION COUNTS, 1986-1995

<u>SURVEY REACH</u>	<u>1995</u>	<u>1994</u>	<u>1993</u>	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>
FORT PECK RESERVOIR	2	9	7	0	10	6	4	3	4	
FORT PECK RIVER	95	58	31	110	66	92	51	18		
LAKE SAKAKAWEA	7	35	14	29	8	6	15	7		
GARRISON RIVER	346	212	135	196	195	174	122	142	175	171
FORT RANDALL RIVER	10	43	38	20	62	67	4	45	60	25
LAKE OAHIE	93	160	123	124	143	100	97	82	21	16
LEWIS & CLARK LAKE	16	44	76	22	25	21	29	0	0	0
GAVINS POINT RIVER	93	211	272	186	193	166	210	252	232	181
TOTAL	664	772	696	689	702	632	532	549	492	393

PRODUCTIVITY AND RECRUITMENT OF FLIGHTED CHICKS

Productivity monitoring provides a standard of measurement onto which success or failure of implemented management practices can be evaluated. The most critical scale of any recovery effort must be rated with the return gained from annual reproductive efforts or in the recruitment of young to the adult population. No matter how much habitat is created or prudent measures implemented, nothing will recover piping plover and least tern populations unless annual productivity exceeds annual mortality. In light of this, fledge ratio goals (number of juveniles produced annually per pair of breeding adults) were established by the Biological Opinion to give the Corps a target to meet in implementing management activities on the Missouri River. Correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting recovery goals. Every effort was made to accurately collect and report all aspects of the productivity monitoring activities during 1995.

Sites identified, through early habitat use surveys, to contain active nesting colonies were revisited every seven - ten days during the duration of the summer to record nesting activity and chick survival. (The exception was the Fort Peck River Reach where productivity was geographically subsampled.) Active nesting sites were searched to determine the number of nests and principle causative factors responsible for any nest being prematurely terminated. Each colony was searched on foot with the aid of binoculars. Nests were located by observing adult behavior or by doing systematic searches of the colony site.

Each nest was identified by placing a numbered wooden tongue depressor within one meter of the nest. Nests were relocated every seven to ten days until the nest was terminated. All on site activity was limited to thirty minutes or less including any passive predator management activities.

Information collected from each nest was recorded on a standardized nest card and included species, number of eggs, stage of incubation-obtained through use of the egg flotation method, nest location, nest initiation date, and nest fate. Cause of nest termination was recorded as hatched or destroyed, with hatched nests being determined by the presence of piping fragments or chick excrement in the nest bowl. A nest was considered successful if it hatched a single egg from the clutch. Destroyed nests were identified to a principle causative factor including but not limited to, flooding, weather, human disturbance, predation, and abandonment. If a cause could not be determined the nest was listed as destroyed - unknown. If it could not be determined if a nest had hatched the nest was listed as fate unknown.

Chick survival was recorded during weekly nest searches of nesting areas. As the breeding season progressed, efforts were concentrated on locating chicks and keeping track of fledged chicks using natal areas. Chicks were typically flushed ahead of observers on the nesting sites and were aged by visual observation of size and primary feather development. Care was taken to prevent chicks from fleeing into the water in efforts to escape from the observers. Chicks were tracked during the fledging period by recording each observation on a chick record portion of the adult census card. Because of a high probability of fledging before the next week's visit twenty-two day old plovers and fifteen day old least terns were considered fledged.

Productivity varied dramatically within the system. High lake levels on Fort Peck Lake, Lake Sakakawea, Lake Oahe, and Lewis & Clark Lake eliminated most of the nesting habitat for the terns and plovers. Likewise high releases from Fort Randall Dam and Gavins Point Dam had the same effect on the river reaches below the two dams. Conversely the low releases out of Garrison Dam for most of the summer proved to be a bonanza for the birds. Results of the 1995 production surveys are given for terns (Table Page 34) and for plovers (Table Page 34). See Appendix B for a site by site synopsis of the mainstem system. A reach by reach summary of productivity follows.

Fort Peck Lake: Least terns nested on two beaches in 1995. Four of the nests were located on the same beach used by the terns in 1994. A single nest was located on another beach. All five nests were lost by flooding from the rising lake. The piping plovers were more widely distributed than the terns with nests being found at eight sites around the lake. Only two of the ten plover nests on the lake successfully hatched eggs with a total of three chicks fledging from these nests. As with the terns, flooding was the primary cause for the loss of nests with six nests succumbing to the rising lake. The other two nests were predated.

Fort Peck River: For the first time two subsamples of this reach were monitored. The west subsample produced seven least tern nesting sites; up two compared to 1994. Nesting success for the terns was exceptional with 80% (20/25) of the nests hatching. From this group a total of 21 tern chicks fledged for a subsample fledge ratio of 1.00 chicks per pair of adults. Weather events had an adverse effect on the terns. At least three chicks and one adult were killed in a hail storm. Two nests were lost to rain storms. A third nest was lost to flooding. Predators took the other two destroyed nests. The major predator appears to have been the mink. This species left the most sign of any predator in the subsample.

For the east subsample no habitat was available through May and June due to high inflows from the Yellowstone River. After flows from the Yellowstone reduced in July a tern colony of six nests was discovered at RM 1580.3. None of the eggs from this colony hatched. All the nests were destroyed from rain and hail storms which hit the area in late July.

Piping plovers were found only in the west subsample of the reach. There the birds tripled the number of nests found on the subsample compared to 1994. However this represented just three nests, each at a different location. All three nests hatched with a total of seven chicks fledging. The fledge ratio for the plovers was a robust 2.33 chicks per pair of adults.

Lake Sakakawea: Only two least terns nests were found on Lake Sakakawea in 1995. By the time of the arrival of the terns to the area in June the majority of the beach habitat in the reach was already under water. Both nests were lost to inundation by the lake.

The piping plovers were widely distributed across Lake Sakakawea with nests being found at twelve sites around the lake. Five of these sites represent nests at locations that did not have any known plover nests in 1994. Four of these nest site locations were in the northern half of the lake. Nest success for plovers on the lake was poor with a hatching success of 11.9% (5/42). This poor rate was due to high lake level experienced on Sakakawea in 1995. Fifteen nests were lost to flooding from the rising lake. Another fourteen nests that were collected in June would have been lost to flooding. A disturbing occurrence was the loss of six plover nests to human disturbance. All six nests were located near recreation areas. No known fledged chicks were produced off the reach.

Garrison River: The Garrison River Reach produced 29 least tern nesting sites including seven major colonies of more than ten nests apiece, four moderate sized colonies of between five to nine nests, and eighteen sites of between one to four nests. The number of nesting sites utilized by the terns increased 53% (29/19) compared to 1994. This undoubtedly was the result of more habitat being available due to low releases out of Garrison Dam. Another possible contributing factor was a lack of habitat on Lakes Sakakawea and Oahe. The high water levels on these lakes may have forced the terns to move to the reach. Nest success was 45.3% (72/159). The two highest categories of nest failure were fate unknown (38) and destroyed unknown (19) which accounted for 66% (57/87) of the nest failures. A total of 126 tern chicks fledged off the reach for a very good fledge ratio of 0.72 (126 chicks/174 adult pairs). The high releases out of Garrison in late

July and August necessitated the removal of eggs from the reach. Twenty-eight eggs from fifteen tern nests were removed and transported to the Gavins Point Project in Nebraska. There the eggs were incubated and the resulting chicks were captively raised. (See captive rearing program.)

Piping plovers nested at 41 sites within the reach. This represents an increase of 241% (41/17) compared to 1994. Thirteen sites contained between five to nine nests, and twenty-eight sites had between one to four nests. The plovers had a very good nest success of 63% (85/136). This in turn led to a fledge ratio of 0.85 (122 fledged chicks/144 adult pairs). The leading causes of nest failures were destroyed unknown (12), fate unknown (9), and predated (8). As with the terns, plover eggs and chicks were removed in late July before high releases from Garrison Dam inundated the low lying sandbars in the reach. Forty eggs from fourteen nests and nine chicks were collected and transported to the Gavins Point Project for incubation and rearing.

Lake Oahe: Tern and Plover numbers on the Lake Oahe Reach fell substantially compared to 1994. This probably resulted from the record high water level the lake experienced in 1995. Least terns nested at two sites on the lake, Dredge Island, (RM 1270.0) and Indian Creek (RM 1192.3). Dredge Island was the site of a large tern colony in 1994 and was the only site on the North Dakota side of the lake that had nesting habitat available for the birds. The Indian Creek tern colony was located in a cul-de-sac just off of the Indian Creek Campground. Overall nest success at the two colonies was 37.1% (13/35). The Indian Creek colony was hard hit by predators, losing seven nests. Abandonment (7), and fate unknown (6) were the other leading causes of nest failures. No tern chicks were known to have fledged off the reach.

Piping plovers nested at six locations on Lake Oahe and on one site below Oahe Dam. The largest concentrations of plover nests were at Dredge Island (9) and Okobojo Point (5). Nest success for the plovers was 33% (7/21). Flooding and destroyed unknown were the leading causes of nest failure at four each. Despite the poor nest success the fledge ratio for the Reach was a very good 0.93 (14 chicks/15 adult pairs). Three plover nests were collected off the lake in June. The eggs from these nests were transported to the Lincoln Park Zoo in Chicago and the Milwaukee County Zoo. There the eggs were incubated and the resulting chicks were captively reared by zoo personnel.

Fort Randall River: The low releases from Fort Randall Dam in May created favorable nesting conditions for the terns and plovers on the river below the dam. These conditions

came to an end in June as the need to evacuate water from Lake Francis Case and upriver reservoirs became necessary. On June 1 Lake Francis Case behind Fort Randall Dam set a record high elevation of 1367.9 feet msl. Increased releases throughout June and July eliminated all nesting habitat within the reach.

There were 26 tern nests at two locations within the reach. None were successfully hatched. Eleven nests were flooded and eleven more were collected for incubation at the Gavins Point Project. The remaining four nests were lost to predation. Seven plover nests shared the two nesting sites with the terns. All seven plover nests were lost to flooding.

Lewis & Clark Lake: Least terns nested at three locations on Lewis & Clark Lake. These sites included one major colony of eleven nests, a minor colony of five nests and one solitary nest. There were three piping plover nests at three locations on the lake. Inflows into the upper lake raised havoc with the nesting terns and plovers. Five tern nests were destroyed by inundation by the lake. Eggs from twelve tern nests and two plover nests were collected off the lake and removed to the Gavins Point Project for incubation. The remaining plover nest was lost to predation. There was no successful hatching of any nests off the lake in 1995.

Gavins Point River: Though some nests were inundated when releases from Gavins Point Dam were increased to 25,000 cfs on May 31, habitat conditions on the reach remained favorable for the birds through the first month of the nesting season. This situation changed in mid June. Above average runoff in the upper Basin and low releases from the dams due to lower Basin flooding caused the water levels of the lakes formed by Garrison Dam, Oahe, Dam and Fort Randall Dam to rise into the exclusive flood control zones. Lake Oahe and Lake Francis Case rose to record levels and Lake Sakakawea rose to its second highest level. This necessitated the evacuation of water in the reservoir system and the increase of releases out of Gavins Point. Consequently Corps personnel began moving nests to higher elevations and removed eggs from nests endangered by inundation. The eggs were transported to the Gavins Point Project where they were incubated. Releases from Gavins Point were gradually raised throughout the summer to a peak of 54,000 cfs on August 16.

The increased releases played havoc on the nesting success of the two species on the Gavins Point Reach. The plovers nested at eleven sites on the reach compared to eighteen for 1994. Nesting sites for terns were likewise down, nine for 1995 compared to fourteen for 1994. Only nine of fifty-six plover nests successfully hatched. The eggs of half of all plover nests on the reach were collected (28/56). These would have been otherwise lost to

flooding. Predators were also very destructive of plover nests, destroying twelve nests. A quarter of all tern nests on the reach (30/118) successfully hatched. The eggs of about a third of the tern nests were collected (40/118) and incubated at the Gavins Point Project. As with plovers the terns suffered large losses to predators with 31 nests being destroyed.

10 2 0 0 23.0 74 7 0 0

[illegible]

TABLE 5

[illegible]

HABITAT MANAGEMENT

Due to high reservoir levels and high releases from Garrison and Gavins Point Dams very little habitat improvement work could be done in 1995. What work was done is summarized in a reach by reach description.

Fort Peck Reservoir: No habitat improvement work was done.

Fort Peck River: In September 1995 Corps personnel from the Garrison Project cleared about one acre of willows from an island at RM 1578.5. The willows were removed from a high point on the island's west end. The purpose of the project was to provide habitat for the terns and plovers during high river flows that occur due to the confluence with the Yellowstone River at RM 1582. In the spring of 1996 the cleared area will be herbicided with Rodeo after the willows sprout, but before the plovers return to the area.

Lake Sakakawea: Due to the extremely high lake level in 1995 no habitat work was done on Lake Sakakawea.

Garrison River: Due to high releases from Garrison Dam from August through the winter of 1995, no habitat work was done in this reach. It is expected that the high releases had a beneficial effect on the reach by scouring beaches of vegetation and by building up sandbars.

Lake Oahe: In April the sites that had been chemically treated the previous fall were dragged and leveled. These areas included sites at Mission Island Mission Peninsula, Okobojo Island, Plum Creek, and Dry Creek.

Fort Randall River: No habitat improvement work was done.

Lewis & Clark Lake: No habitat improvement work was done.

Gavins Point River: No habitat improvement work was done.

MANAGEMENT ACTIONS

Several management actions were undertaken to protect nesting sites, increase productivity, and increase public awareness. Some of these measures have been ongoing for several years. Others have been done on a limited basis previously, but were expanded in 1995. Still others were tried for the first time in 1995. These management actions are discussed below with the exception of the Captive Rearing Program which is discussed under it's own section.

Predator Aversion Measures

Predator exclosure cages were utilized to increase survivability of piping plover nests. Cages were constructed of either 2"x 4" welded wire mesh or 2"x 2" wire mesh and were 2' x 2' x 2' in size. The cages were held in place with electric fence t-posts or by 14" wire hook stakes. Assembly and installation time was approximately five minutes. Cages were assembled on site during the time allowed for productivity monitoring activities. Hands were washed with no scent soap prior to the handling of any cage components. After cage installation the nest was monitored to ensure that the nesting adult returned to the nest. In one case at Lake Sakakawea a nesting adult refused to enter the cage. The cage was then removed and the adult resumed nesting. Otherwise there was no apparent avoidance of caged nests by piping plovers.

Piping plover nest cages were used on four of the eight reaches. (Cages were not used on the Fort Peck Reservoir, Fort Peck River, Fort Randall River, and Lewis & Clark Lake Reaches.) Overall 49% (137/278) of the piping plover nests on the Missouri River System were caged. Excluding the four reaches where cages were not used the figure rises to 54% (137/255). There are several reasons why cages were not placed over every plover nest. In some cases it was not possible to place a cage due to the proximity of vegetation or other features next to the nest. Cages were not placed over nests where the eggs were pipping or already hatched. On several occasions cages were not available when the nest was discovered. Also when it became evident that eggs were going to be collected for captive rearing program, newly discovered nests were not caged.

In general nests that were caged had a higher survivability, 58% (62/114), than uncaged nests, 42% (45/107). (These numbers do not include nests where the eggs were collected.) The survivability of uncaged nests in the four reaches where cages were used

was markedly higher, 41% (40/97), than in the four reaches where cages were not used, 25% (5/20). Results of cage use during 1995 by reach are shown in the following table.

MAINSTEM MISSOURI RIVER PIPING PLOVER NESTS - CAGED 1995

LKSKRES	28	2	0	8	10.0	10	1	6	0	1	0	0	0
GARRIV	81	53	4	4	74.0	1	6	0	3	0	3	4	3
LKOHRE	15	7	0	1	50.0	3	0	0	0	0	2	2	0
GAPTRIV	13	0	0	10	0.0	0	2	1	0	0	0	0	0
TOTAL	137	62	4	23	57.9	14	9	7	3	1	5	6	3

*NEST SUCCESS = NESTS HATCHED/NESTS CAGED - NEST COLLECTED PER 100

MAINSTEM MISSOURI RIVER PIPING PLOVER NESTS - UNCAGED 1995

FTPKRE	10	2	0	0	20.0	6	2	0	0	0	0	0	0
FTPKRIV	3	3	0	0	100.0	0	0	0	0	0	0	0	0
LKSKRES	14	3	0	6	37.5	4	0	0	0	0	0	0	1
GARRIV	55	28	0	6	57.1	3	2	0	0	0	9	5	2
LKOHRE	6	0	0	2	0.0	1	1	0	2	0	0	0	0
FTRLRIV	7	0	0	0	0.0	7	0	0	0	0	0	0	0
LECLRES	3	0	0	2	0.0	0	1	0	0	0	0	0	0
GAPTRIV	43	9	0	18	36.0	3	10	0	0	0	1	1	1
TOTAL	141	45	0	34	42.1	24	16	0	2	0	10	6	4

*NEST SUCCESS = NESTS HATCHED/NESTS UNCAGED - NEST COLLECTED PER 100

A negative consequence of caging plover nests may have occurred at Lake Sakakawea. Six caged nests in this reach were destroyed by human disturbance. All of these nests were located near recreation areas and it is probable that the cages acted as attractants to the public. The public was informed that the nest sites were protected through the placement of warning signs, barricades, and roping off the area around the caged nests.

It is recommended that cages still be placed over nests in areas that have moderate to high recreation activities. In addition to signs, barricades, and restricted access areas around the caged nests it is recommended that the areas be patrolled, especially on weekends to protect the nests and inform the public.

Strobe light systems were not used in 1995. Though effective in 1994 the elimination of habitat and collecting of eggs precluded the use of the strobe lights.

Predator Removal

No predator removal measures were undertaken during the normal course of productivity monitoring on the eight reaches. (See Captive Rearing section for a discussion of predator removal measures associated with that program.)

Sign Posting and Fencing

Nest sites close to or within recreation areas or areas with the high potential for human disturbance were posted with restriction signs. These signs informed the public of the presence of endangered species and prohibited entry into the restricted area. The restricted area could further be delineated with orange twine strung on steel posts. A reach by reach description follows.

Lake Sakakawea Reach: Barricades were placed across vehicle trails near the Steinke Bay and Little Egypt Recreation Areas. The barricades were placed to prevent vehicles from traveling onto beaches occupied by plover nests. The barricades were also signed informing the public of the presence of the plovers and that disturbing the birds was a violation of federal law. Plover nests at Little Egypt and Tobacco Garden Bay were also "fenced off" with string to delineate a "No Trespassing" boundary. The two areas were also posted with signs

Garrison River: The northern part of the island at RM 1374.5 was signed due to the presence of a large tern colony. There was no evidence that the colony was disturbed by humans, but all the signs on the island were stolen. Due to high recreation use near Bismarck signs were placed to protect nesting sites on islands at RM 1319.8, RM 1309.5, RM 1308.7, and 1307.5.

Lake Oahe: On May 31 a piping plover nest was discovered in the boat trailer parking lot of the Indian Creek boat ramp. The area around the nest was roped off with fence posts and orange twine and "Do Not Enter" signs were posted. About 60% of the parking lot was blocked off to protect the nest. The nest was later successfully moved. (See nest relocation section.) On June 1 Oahe Project personnel observed least tern nesting activity in a road cul-de-sac near the B loop of the Indian Creek Campground. The road cul-de-sac was blocked off with orange construction fence and Do Not Enter signs were posted. The fence was then extended into the campground to cover campsites 7, 9, 11, 13, & 15. A tern colony formed at the cul-de-sac and peaked with ten active nests. The area remained closed until July 7 when it was determined that the terns had abandoned the site.

Gavins Point River: Signs were placed to protect nesting sites on islands at RM 804.6, RM 804.5, RM 802.0, and RM 801.0.

Nest Relocation

Nest moving was done to prevent the destruction of nests by rising lake or river levels. Nests were moved by various means from moving the entire nest and surrounding substrate to creation of a new nest. Though it was recommended that the nests be moved a maximum of nine feet, moves of up to twenty feet were successfully completed. After a nest was moved the nest was watched to see if the adult found the new location. If the adult was unable to locate the new site the nest was returned to the old location.

Fort Peck Lake: One tern nest was moved at Fort Peck Lake. It was later lost to flooding. Three plover nests were moved at Fort Peck Lake. One was moved five times but was lost to flooding. Another nest was moved three times and was successfully hatched. One plover chick from this nest was known to fledge. The third nest was moved once, but was later lost to flooding.

Lake Sakakawea: Both tern nests on the lake were successfully moved. Both were later lost to flooding. Plover nest moving had a success rate of 79% (15/19). The greatest success for the movement of plover nests were those that had been previously caged. Ten of the nineteen move attempts involved caged nests. All ten were successfully moved. The success rate for moves of uncaged nests was 56% (5/9). Most likely the adult bird used the cage as a visual cue for relocating the nest. Subsequently one of the successfully moved nests hatched, nine were collected for captive rearing, and five were lost to flooding from the lake. All four of the nests involved in unsuccessful moves were lost to flooding.

Garrison River: Two plover nests were moved in this reach. One subsequently hatched, the other was collected for captive rearing.

Lake Oahe: Personnel at the Mobridge and Pierre Resource Offices constructed nest platforms as a means of moving plover nests. At Mobridge it was decided to move the plover nest to afford it more protection and to open up part of the parking lot for boaters. Mobridge personnel built a 14"x12"x1" tray. The nest was then moved onto the tray but duplicating the surrounding substrate and using the pebbles from the original nest lining. A cage was then placed over the platform. The nesting adult readily returned to the nest. Over a period of three days the nest platform was moved about thirty feet. Two of the three eggs from the nest successfully hatched.

Nest platforms were constructed by Pierre personnel to move plover nests endangered by the rising of Lake Oahe. The nest platform was thirty inches square and two inches deep. A cord was attached to facilitate moving the platform. Like the Mobridge platform, surrounding substrate and pebbles from the original nest lining were used to replicate the nest. The platform was buried so that it was level with the surrounding terrain. The nest was then caged. Initially nest moves were limited to one to two feet to acclimate the nesting adult to the procedure. Eventually moves of up to 25 feet were accomplished.

Chick Relocation

Transportation of unfledged piping plover chicks to a new location was done only in cases where threat of destruction was imminent due to the inundation of the chick's former location.

Fort Peck Lake: On June 25 USFWS and Corps personnel captured and removed two plover chicks from an island in Fort Peck Lake that was in danger of inundation. The two chicks were released on the shore of the mainland 150 yards from the island. The adult plover that was with the chicks on the island was driven off by the crew. The adult tried to return to the island and was driven off a second time. The adult eventually landed on the mainland near the chicks. On June 28 the mainland site was visited and two adults and two chicks were observed. Both chicks fledged in July.

Garrison River: The increase of releases from Garrison Dam in late July and early August threatened several nearly fledged plover chicks by inundating their island habitat. On August 8 nineteen plover chicks; three from an island at RM 1308.7, five from RM 1320.0, three from RM 1345.5, three from RM 1347.5, and five from RM 1357.0, were captured and transported to an island at RM 1369.8. This island was not in danger of inundation and contained large areas of suitable habitat for the birds. The birds were released on the island and fledged there.

Berm or Island Building

Earth moving measures were done either to build up an area to survive a flood situation or done to protect a nest site in danger of inundation.

Fort Peck River: A berm was constructed to partially surround a least tern nest in danger of inundation. The berm was constructed with sandbags and built in a crescent shape with both ends tying into existing high ridges. A small trench was dug on the inner side of the berm to collect any water that breached or bypassed the berm. The tern returned the nest after the berm was finished. The berm prevented the nest from being flooded and the eggs in the nest were successfully hatched.

Garrison River: Due to increases in releases from Garrison Dam in late July and early August two islands at RM 1308.7 and an island at RM 1345.5 were built up. The purpose of the island building was to give the unfledged plover chicks on the islands an escape area that would survive the higher water levels resulting from the increased releases. The islands were built up through shovel power and by using all terrain vehicles equipped with blades to push up sand. The areas were built up about two feet high. The built up area on the island at RM 1345.5 was about 25 feet square in size (625 square feet). The built up

areas on the other two islands were slightly smaller. The built up areas were stabilized with logs place on the upstream side.

The project proved to be unsuccessful. The built up area on one island at RM 1308.7 was washed away. The plover chicks were then removed to the island at RM 1369.8. The built up area on the other island at RM 1308.7 was not used. The chicks were either predated or fledged off the island. The island at RM 1345.5 was divided into three separate islands by the rising river and the plover chicks were cut off from the built up area. These chicks were then captured and removed to the island at RM 1369.8.

Public Awareness: Public awareness of the status of the least terns and piping plovers on the Missouri River System was accomplished by several means including interpretive programs at Corps of Engineers campgrounds and off site, newspaper articles, television and radio interviews, and information signs.

Specimen Collection for Contaminate Analysis

A total of 3 adult terns, 10 tern chicks, 39 tern eggs, 1 adult plover, 3 plover chicks, and 34 plover eggs were collected during field activities and will be forwarded to respective federal contaminate labs for analysis.

A total of 8 tern juveniles, 5 tern chicks, 6 plover juveniles, and 7 plover chicks were collected during captive rearing program and will be forwarded to respective federal contaminate labs for analysis.

CAPTIVE REARING PROGRAM

The Missouri River main stem system above Sioux City Iowa experienced runoff of 151 percent of normal (37.2 million acre feet) during 1995. Lake Oahe behind Oahe Dam and Lake Francis Case behind Fort Randall Dam experienced record lake elevations in 1995. Lake Sakakawca behind Garrison Dam recorded it's second highest lake elevation. This above average runoff required the Corps to enter into flood water evacuation service level on the river. With these unstable conditions and daily changes to system releases, availability of nesting habitat changed rapidly and subsequently jeopardized nesting efforts on several reaches of the Missouri River. In an effort to prevent dramatic losses of nests initiated on unsecure habitats, the Corps, under authority

of the amended 1995 subpermit 93-07, conducted an egg salvage operation and captively reared chicks for release back into the wild.

Eggs collected during 1995 were only those ultimately determined to be in imminent danger of being inundated during the evacuation of stored flood waters. All efforts were made to retain viability of natural nesting sites. Nests predicted (through UNET modeling) to be inundated by a scheduled flood water evacuation release were collected along with nests predicted to be flooded by rising reservoir elevations. Attending adults were allowed to incubate the eggs until just prior to the inundating flow. This ensured that the birds did not attempt to renest on the jeopardized habitat prior to it being covered. Egg incubation, rearing of chicks, and release of fledged juveniles were conducted according to the "Incubation, Propagation, and Release of Least Tern and Piping Plover Eggs Collected During the 1995 Missouri River Flood Control Operation Plan."

During the 1995 salvage effort, 20.6% of the plover eggs (197/956) and 18.0% of the tern eggs (160/888) located on the Missouri River, were collected. Hatching success for the piping plover eggs was 70% with 96% of the chicks hatched eventually fledging and being released. Least tern hatching success was 70% with 70% of the chicks hatched fledging and being released. The table below contains a reach by reach account of the 1995 collection and captive rearing efforts.

	Piping Plovers				Least Terns			
	<u>Collect</u>	<u>Hatch</u>	<u>Release</u>	<u>Re/Hat</u>	<u>Collect</u>	<u>Hatch</u>	<u>Release</u>	<u>Re/Hat</u>
Lake Sakakawea	51	47	44	94%	0	0	0	0
Garrison Reach	40	33	33	100%	28	16	13	81%
Lake Oahe	8	6	4	67%	0	0	0	0
Fort Randall Reach	0	0	0	0	17	10	9	90%
Lewis & Clark Lake	5	4	4	100	23	14	6	43%
Gavins Point Reach	93	78	76	97%	92	72	50	69%
Total	197	168	161	96%	160	112	78	70%

Fledged least terns and piping plovers were released on secure habitats once they had shown the ability to be able to procure the own food. In 1995, least tern and piping plover fledglings were released at sites on the Missouri River below Gavins Point Dam, on Lewis and Clark Lake, along the lower ten miles of the Niobrara River in north central Nebraska. In addition, several least terns were released on the Platte River in central

Nebraska near Ashland and several plovers were released on the Missouri River below Garrison Dam in central North Dakota. Prior to release, all piping plovers were banded with an aluminum or stainless steel 1A or 1B USFWS leg band on their left tarsometatarsus and with a light blue Darvic™ flag on their right tibiotarsus. Least terns were banded with an aluminum or stainless steel 1A USFWS leg band on their left tarsometatarsus.

Thank you to the following people and their crew of dedicated staff who have diligently conducted the surveys, compiled the data, and submitted the annual field report.

MR. GORDON WARRICK - FTPKRES and FTPKRIV

MR. KEITH GORDON - FTPKRIV and LKSKRES

MR. GREG PAVELKA - LKSKRES and GARRRIV

MR. BILL MAY - GARRRIV and LKOARES

MS. TERRI THOMAS - LKOARES

MR. JIM SUEDKAMP - LKOARES

MR. BLAINE CUNNINGHAM - FTRLRIV

STAFF OF LEWIS AND CLARK LAKE

Casey D. Kruse

Wildlife Biologist/Field Coordinator

**MISSOURI RIVER
INTERIOR LEAST TERN AND PIPING PLOVER
POPULATION STATUS AND PRODUCTIVITY SUMMARY**

including
Permit Activity Report



**US Army Corps
of Engineers**
Omaha District

DECEMBER 1996

1996 AT-A-GLANCE

INTERIOR LEAST TERN (STERNA ANTILLARIUM)

Missouri River Population Survey & Productivity Monitoring

	ADULT CENSUS	MONITORED ADULT CEN	NESTS	NESTS (a)	SUCCESS	EGGS	CLUTCH SIZE	EGGS HATCHED	CHICKS FLEDGED	MONITORED CHICKS FLEDGED	TOTAL CHICKS FLEDGED	FLEDGED RATIO	COLLECTED NESTS	COLLECTED EGGS	COLLECTED FLEDGED
Fort Peck Lake	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0
Fort Peck River	128	41	28*	11*	39.3*	62*	2.21*	25*	7	21**	0.34	0	0	0	0
Lake Sakatawea	27	27	19	4	21.1	39	2.06	6	2	2	0.15	9	23	21	21
Garrison River	105	105	88	8	9.1	155	1.76	14	4	4	0.08	30	57	51	51
Lake Oahe	74	74	43	10	23.3	93	2.16	22	9	9	0.24	0	0	0	0
Fort Randall River	2	2	1	0	0.0	2	2.00	0	0	0	0.00	0	0	0	0
Lewis and Clark	28	28	7	0	0.0	16	2.29	0	0	0	0.00	7	16	13	13
Gavins Point River	80	80	96	6	6.3	179	1.86	9	0	11	0.28	56	108	91	91
TOTAL	444	357	282	37	13.1	544	1.93	76	22	47	0.21	102	204	176	176

a = Nests per 100 attempts

b = fledged chicks per pair of adult birds (Does not include collected fledged.)

* = Numbers represent monitored Reach subsample

** = Fledge Ratio x Adult Census Pairs

1996 AT-A-GLANCE

PIPING PLOVER (*CHARADRIUS MELODUS*)

Missouri River Population Survey & Productivity Monitoring

	ADULT CENSUS	MONITORED ADULT CEN	NESTS 0	NESTS 0	NESTS 0	NESTING SUCCESS	EGGS 0	AVE CLUTCH SIZE	EGGS HATCHED	CHICKS FLEDGED	MONITORED CHICKS FLEDGED	TOTAL CHICKS FLEDGED	FLEDGED RATIO	COLLECTED NESTS	COLLECTED EGGS	COLLECTED FLEDGED
Fort Peck Lake	0	0	0	0	0	0.0	0	0.00	0	0	0	0	0.00	0	0	0
Fort Peck River	24	10	6*	3*	3*	50.0	23*	3.63*	6	5	12**	12**	1.00	0	0	0
Lake Sakakawea	66	66	43	17	17	39.5	159	3.70	56	20	20	20	0.61	16	61	43
Garrison River	41	41	26	1	1	3.8	69	2.27	2	2	2	2	0.10	9	21	15
Lake Oahe	20	20	18	2	2	11.1	45	2.50	6	3	3	3	0.30	0	0	0
Fort Randall River	3	3	0	0	0	0.0	0	0.00	0	0	0	0	0.00	0	0	0
Lewis and Clark	6	6	18	0	0	0.0	39	2.17	0	0	0	0	0.00	17	38	29
Gavins Point River	22	22	14	0	0	0.0	36	2.57	0	0	0	0	0.00	8	20	15
TOTAL	182	186	125	23	23	16.4	361	2.89	72	30	37	37	0.41	50	140	102

a = Nests per 100 attempts

b = fledged chicks per pair of adult birds (Does not include collected fledged.)

* = Numbers represent monitored Reach subsample

** = Fledge Ratio x Adult Census Pairs

SUBJECT: U.S. Army Corps of Engineers annual report on the Missouri River interior least tern (*Sterna antillarum*) and piping plover (*Charadrius melodus*) population status and productivity including activities conducted under endangered species research permit PRT-704930, subpermit 93-07.

PURPOSE: This report is intended to provide annual trend data on the adult populations and production estimates of least terns and piping plovers nesting along monitored reaches of the mainstem Missouri River during 1996. Efforts have been made to standardize data presentation in this report so that comparisons can be made with previous data collected on these reaches. All activities and procedures used to collect this data during the 1996 nesting season are discussed within this document. This report represents compiled data from eight U.S. Army Corps of Engineers Project and Natural Resource Offices, a contracted U.S. Fish and Wildlife Service-Ecological Services Office, and a contracted tribal fish and wildlife agency. If procedural information in greater detail than what is presented herewithin is required for comparative studies, unassimilated field office reports are available from the Operations Division of the Omaha District, U.S. Army Corps of Engineers, 215 North 17th Street, Omaha, NE 68102-4978.

INTRODUCTION: The U.S. Army Corps of Engineers (Corps) received a jeopardy Biological Opinion on the operations of the Missouri River Main-stem System from the U.S. Fish and Wildlife Service (USFWS) on November 14, 1990. This Biological Opinion (Opinion) concluded that the operations of the Missouri River would likely jeopardize the continued existence of the interior population of the least tern (*Sterna antillarum*) and the Great Plains population of the piping plover (*Charadrius melodus*). The least tern was listed as state and federally endangered in 1985. The piping plover was listed as state and federally threatened also in 1985.

The Opinion included Reasonable and Prudent Measures, Reasonable and Prudent Alternatives, and Conservation Measures that, if implemented, would preclude jeopardy to these species. The preclusion of jeopardy was based on production to be measured by fledge ratios of least terns and piping plovers on the Missouri River. Implementation of recovery measures is to be monitored through annual breeding adult population censuses and productivity surveys. Once productivity standards are achieved they will be maintained and monitored for ten consecutive years.

During the period from 1986-89, in anticipation of an Opinion, the Corps funded a series of studies to determine the population distribution of least terns and piping plovers

throughout the Missouri River basin, and to determine factors influencing the decline of these species. Based on findings of these studies, measures were initiated to reduce the impacts of human recreation on nesting areas, and water release hydrographs were developed to prevent flooding of nests and pre-fledged chicks.

Upon receiving the Opinion in 1990, the Corps intensified efforts to gather life history data and vital rates of piping plovers and least terns nesting on the Missouri River. Universities and the USFWS were contracted to collect this information during a second series of studies. Further measures, resulting from these continuing studies, have been developed and are currently being implemented to deter predation on the nesting colonies, to better control the inundation of low elevation nesting sites, and to retard the loss of habitat due to vegetation encroachment.

The 1996 nesting season marks the fourth consecutive year that Corps of Engineers personnel have conducted the survey and monitoring activities for the least tern and piping plover on the mainstem Missouri River system. Corps staff from five Project Offices and three satellite Natural Resource Offices were involved on seven of eight designated reaches of the Missouri River. These staff members conducted adult population surveys and productivity monitoring of nesting sites along nearly 850 miles of river and reservoir shoreline. In addition, the Corps provided funding for scope-of-work contracts with the USFWS-Montana Ecological Services field office and the Cheyenne River Sioux Tribal Fish and Wildlife Agency. These agencies surveyed and monitored an additional reach and part of a second reach involving 60 river miles.

Data collection was standardized through the continued use of basin wide data cards for nest sites, adult surveys, and chick observations (See Appendix A for examples of nest cards and adult census cards). A guidelines manual for field personnel to use during piping plover and least tern survey and monitoring activities was utilized during the field season. Two training sessions, covering proper field techniques, chick identification, juvenile aging, permit compliance, and record keeping, were held at Bismarck ND in May and June. A total of 44 persons involved with either the adult surveys or the productivity monitoring attended the training..

All work was conducted in compliance with the conditions of the endangered species research permit (Regional Blanket Permit PRT-704930, subpermit 93-07) issued to the U.S. Army Corps of Engineers, Omaha District, Omaha, Nebraska, by the USFWS's Denver Regional Office to work on least terns and piping plovers within the Missouri River Basin during 1996, and with authorization of represented state game and fish departments. Contracted agencies were individually permitted.

DESIGNATED STUDY REACHES

Study development included designating eight reaches, historically identified as plover and tern nesting areas within the mainstem Missouri River, to be used as management units. These reaches were selected based on geographic location, hydrographic characteristics, and the ability to control or influence water elevations through dam releases. These eight management units include four riverine or lotic reaches and four reservoir reaches. Project or field office responsibilities for adult censuses and productivity monitoring was determined by proximity to the given reach.

The river and reservoir reaches, the agency and office conducting the surveys and monitoring activities during 1996, and the inclusive river miles of survey and productivity subsample are listed below.

1. FORT PECK LAKE (FTPKLAK)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Project, Fort Peck, Montana

Adult Census: River Miles 1785.0-1771.0

Productivity: River Miles 1785.0-1771.0

2. MISSOURI RIVER BELOW FORT PECK DAM (FTPKRIV)

Corps Fort Peck Project, Fort Peck, Montana

Adult Census: River Miles 1770.9-1581.5

Productivity: River Miles 1714.0-1673.0

Corps Garrison Project Williston Resource Office, Williston, ND

Adult Census: River Miles 1581.4-1568.1

Productivity: River Miles 1581.4-1568.1

3. LAKE SAKAKAWEA (LAKESAK)

Corps Garrison Project Williston Resource Office, Williston, ND

Adult Census: River Miles 1568.0-1480.5

Productivity: River Miles 1568.0-1480.5

Corps Garrison Project Riverdale Resource Office, Riverdale, ND

Adult Census: River Miles 1480.4-1389.6

Productivity: River Miles 1480.4-1389.6

4. MISSOURI RIVER BELOW GARRISON DAM (GARRRIV)

Corps Garrison Project Riverdale Resource Office, Riverdale, ND

Adult Census: River Miles 1389.2-1355.1

Productivity: River Miles 1389.2-1355.1

Corps Oahe Project Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1355.0-1299.1

Productivity: River Miles 1355.0-1299.1

5. LAKE OAHE (LAKEOAHE)

Corps Oahe Project Bismarck Resource Office, Bismarck, ND

Adult Census: River Miles 1299.0-1232.0

Productivity: River Miles 1299.0-1232.0

Corps Oahe Project Mobridge Resource Office, Mobridge, SD

Adult Census: River Miles 1231.5-1165.1

Productivity: River Miles 1231.5-1165.1

Corps Oahe Project Pierre Resource Office, Pierre, SD

Adult Census: River Miles 1165.0-1072.0

Productivity: River Miles 1165.0-1072.0

Cheyenne River Sioux Tribe, Cheyenne Sioux Reservation, SD

Adult Census: River Miles 1187.0 - 1110.0

6. MISSOURI RIVER BELOW FORT RANDALL DAM (FTRLRIV)

Corps Fort Randall Project Office, Pickstown, SD

Adult Census: River Miles 880.0-845.0

Productivity: River Miles 880.0-845.0

7. LEWIS AND CLARK LAKE (L&CLAKE)

Corps Gavins Point Project Office, Yankton, SD

Adult Census: River Miles 845.0-811.0

Productivity: River Miles 845.0-811.0

8. MISSOURI RIVER BELOW GAVINS POINT DAM (GAPTRIV)

Corps Gavins Point Project Office, Yankton, SD

Adult Census: River Miles 811.0-750.0

Productivity: River Miles 811.0-750.0

The following page shows the location of the reaches within the Missouri River Basin.

155 days. Precipitation in the region averages 25 inches of rainfall annually with the majority of it occurring during the spring and summer months. The average seasonal snowfall for the reach is around 30 inches. Thunderstorms can be expected to occur about 45 days out of the year and tornado and severe weather pass through the region infrequently. Temperatures can exceed 100 degrees Fahrenheit in summer and drop to below zero degrees in the winter months. The average summer daily temperature is 72 degrees and the average winter daily temperature is 24 degrees. The winds are predominantly from the south-southwest during the summer and from the northwest during the winter months. Wind speeds vary greatly, and it is not uncommon to have winds up to 50 mph during the course of the year.

Human activities within the reach include recreation, agriculture, bank stabilization projects, water intakes for cities, and housing developments. Recreational use includes fishing, both from shore and boats, pleasure boating, jet skis, canoeing, swimming and sunbathing. In 1980 the Congress designated this stretch of the Missouri as a National Recreation River.

An important function of this reach is its service as a corridor to provide water for the Missouri River navigation channel. The navigation channel extends from Sioux City, Iowa (river mile 732.3) to the confluence of the Missouri and Mississippi Rivers (river mile 0.0) just north of St. Louis, Missouri. Normally the navigation season on the Missouri runs for eight months, from April 1 to December 1. The season can be lengthened or shortened depending upon ice conditions on the river, water storage in the mainstem reservoirs, and water inflows from tributaries downriver from Gavins Point. To provide for minimum navigation service, releases from Gavins Point Dam must average 24,800 cfs in May, 24,000 cfs in June, 26,700 cfs in July, and 28,200 cfs in August. For full navigation service, releases must average 30,800 cfs in May, 30,000 cfs in June, 32,700 cfs in July, and 34,200 cfs in August.

1996 SURVEY AND MONITORING ACTIVITIES

HABITAT CONDITIONS & BIRD ARRIVALS

Suitable habitat surveys to locate active nesting colonies and nest sites for monitoring purposes were conducted from May to July on the reaches. Surveys were conducted with the aid of binoculars or spotting scope. Potential nesting areas were typically observed from a boat. Large islands or beach areas accessible from land were searched on foot using bird behavior to indicate active nesting colonies. Sites found to have

terns or plovers actively exhibiting nesting or courting behavior were recorded on U.S. Army Corps of Engineers aerial mosaic maps (Appendix C) and monitored during production surveys.

Overall, habitat conditions on the Missouri River System in 1996 were poor for least terns and piping plovers. For a second consecutive year, near record runoff resulted in elevated reservoir levels and increased releases from the dams. Water rose into the exclusive flood zones of Fort Peck Lake and Lake Oahe and came within a half foot of the exclusive flood zone on Lake Sakakawea. Subsequently large areas of habitat were inundated on these lakes. In an effort to evacuate this water, releases from Fort Peck, Garrison, Fort Randall, and Gavins Point Dams were elevated throughout the spring and summer. This increased flow inundated tern and plover habitat on the river reaches below the dams. A reach by reach description of habitat conditions during the arrival of terns and plovers is discussed below.

Fort Peck Lake: The lake elevation of Fort Peck Lake on April 1, 1996 stood at 2241.3 feet msl. This represented a 9.8 foot increase in the lake level compared to April 1, 1995. This higher lake level was due to above normal inflows through the first part of 1996. Through May, June, and the first part of July the lake continued to rise. On June 17 the lake rose into the exclusive flood zone by topping 2246.0 feet msl. Fort Peck Lake peaked at 2247.3 feet msl on July 4 and remained above 2246.0 feet until July 23. These high lake levels inundated beaches that had historically been used for piping plover and least tern nesting. The few areas of bare shoreline remaining in May provided very marginal habitat at best for the returning plovers and terns.

Surveys for plovers and terns began on Fort Peck Lake on May 20. Piping plovers were first observed on the lake on May 29. Least terns were seen for the first time on June 6. Surveys were continued into early August but no nests of either species were found within the reach.

Fort Peck River: The high water level in Fort Peck Lake caused by above average inflows, required higher than normal releases from Fort Peck Dam during the spring and summer nesting season. Releases in May averaged 14,700 cfs. The June average release was 15,500 cfs and July was 15,900 cfs. This compares to a long term average release of 10,000 cfs for May and 11,000 cfs for June and July. As a result, limited habitat was available for the terns and plovers on the reach. Fort Peck personnel estimated that only one third of the habitat available in 1995 was available in 1996. It must be remembered that releases out of Fort

Peck Dam were below normal in the summer of 1995 thus exposing above normal amounts of habitat.

On the west subsample (RM 1714.0 - 1673.0) both piping plovers and least terns were observed on the reach in mid May when the first surveys were conducted. The first nest initiation for plovers occurred on May 25 with the last occurring on June 29. The earliest tern initiation was on June 2 with the last on June 27.

On the east subsample (RM 1581.0 - 1568.0) surveys began on April 17. Plovers were not observed until May 24 and terns not until June 21. No plover nests were ever found on this portion of the reach. The first known tern nest was initiated on July 1 with the latest nest initiation occurring on July 10.

Lake Sakakawea: Like 1995, habitat conditions on Lake Sakakawea again proved to be unfavorable for terns and plovers during the 1996 nesting season. Water levels were above normal on the lake throughout the nesting season. On average, May 1 sees the lake at elevation 1836.1 feet msl. May 1, 1996 saw the lake nearly seven feet higher at 1842.84 feet msl. The lake was kept at this level throughout May ending the month at 1842.94. Lake Sakakawea then rose rapidly in June while storing a good part of the snowmelt from the northern Rockies. The lake ended June at 1848.23 feet msl compared to an average maximum of 1841.1 feet msl. The lake peaked in July at 1849.56 feet msl. This came to within a half foot of entering the lake's exclusive flood zone and was six and half feet higher than the normal July average maximum of 1842.9 feet msl. Even though the lake experienced these high elevations, marginal habitat was available in 1996 due to the even higher elevations recorded in 1995, when the lake peaked at 1852.0 feet msl.

The first survey for the birds on the upper half of Lake Sakakawea was conducted on April 17. Plovers were first observed at Little Egypt on May 17. Plovers were observed at Steink Bay during the initial surveys of the lower half of Lake Sakakawea on May 15. Undoubtedly the plovers had arrived earlier on the lake as a plover nest was initiated at Deepwater Bay on May 12. The last known initiation of a plover nest on Lake Sakakawea was June 25. The first tern on Lake Sakakawea was seen on May 29 at Deepwater Bay. The earliest nest initiation for a tern on the lake was June 5 at Deepwater with the latest nest initiation being July 7.

Garrison River: Habitat conditions on the Garrison Reach for 1996 proved to be almost the opposite of what existed in 1995. Average releases from Garrison Dam in 1995 from May through July ranged from 11,000 to 13,000 cfs. Releases during the summer usually

average around 24,000 cfs. In 1996 releases out of Garrison Dam averaged 36,500 cfs in May, 35,400 cfs in June and 36,700 cfs in July. These high releases resulted in the inundation of most of the sandbar and beach habitat normally available within the reach. These conditions did not change for the entire nesting season except for one seven day period in late June. (See productivity section.)

Monitoring on this reach began on May 13 and two plovers were observed on a sandbar at RM 1369.5. The earliest nest initiation for a plover on the Garrison Reach was on May 22, with the latest occurring on June 30. Terns were first seen on this portion of the Missouri River on May 31. The terns had returned before then as the earliest nest initiation had occurred on May 29 on an island at RM 1369.0. The latest nest initiation for a tern on the Garrison Reach was July 11 at RM 1364.5.

Lake Oahe: As in 1995, very little habitat was available for the plovers and terns on Lake Oahe in 1996. High releases from Garrison Dam and above average precipitation within the region, pushed the lake level of Oahe into the exclusive flood zone above 1617.0 feet msl. While the lake stood at 1612.97 feet msl on May 13, by June 23, Oahe had crested at 1618.67 feet msl. This was only .04 from it's all time record high that was set during 1995. The lake remained in the exclusive flood zone through the end of July. Very little nesting habitat was available for the two species during 1996.

Surveys on Lake Oahe began the week of May 13. Piping plovers were observed during this initial survey. It was later determined the plovers had arrived earlier than this as the earliest nest initiation was calculated to be May 8. The latest nest initiation for a plover was found to be July 2. Terns were first observed on the lake during the last week in May. The earliest tern nest was initiated on June 4 with the latest occurring on July 12.

Fort Randall River: Like the other five dams within the Missouri River basin operated by the Corps of Engineers, releases from Fort Randall Dam were significantly above average during the spring and summer of 1996. In May the releases averaged 32,400 cfs, in June 35,400 cfs, and in July 45,100 cfs. These high releases flooded the few sites available to the birds on this reach.

Surveys on the Fort Randall River Reach began on May 27 and two piping plovers were observed. Least terns were first seen on the reach on May 30. Only one tern nest was found on the reach during the nesting season. This nest was initiated during the third week in June.

Lewis & Clark Lake: Lewis & Clark Lake began May 1 at 1205.02 feet msl. The goal was to maintain the lake at 1206.0 feet throughout the 1996 nesting season. This would provide habitat for the two species at various sites in the upper reach of the lake. Unfortunately this proved impossible to maintain. In May flows into the reach were 225% of normal. The lake peaked in the exclusive flood zone (1208.0 feet msl) at 1208.99 feet on May 29, before falling to 1205.69 feet by June 15. With downstream flooding causing a reduction in system releases, the lake again entered the exclusive flood zone on June 22 rising to 1208.48 feet. The lake was lowered and was maintained around 1206.5 feet for the first half of July. In mid July the lake again rose into the exclusive flood zone for the third time during the nesting season reaching 1208.49 feet on July 18. This rise was again caused by a reduction in releases from Gavins Point due to downriver flooding. These rises into the exclusive flood zone eliminated most of the available beach and sandbar habitat on the lake.

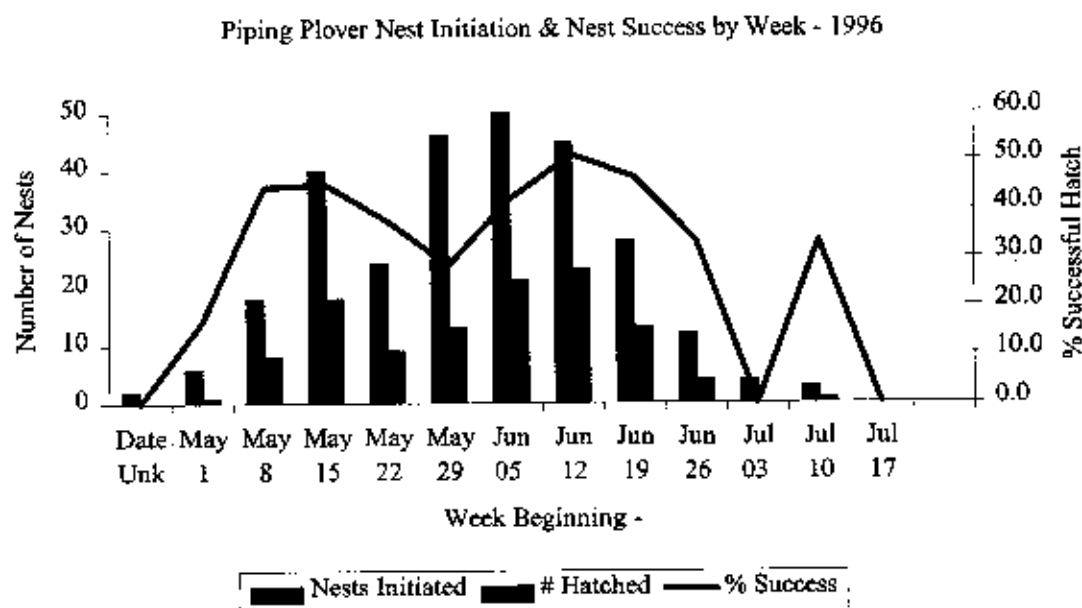
Piping plovers had returned to the reach by the end of April when three were observed at the Niobrara boat ramp. These are believed to have been transients. The first plover nest initiations occurred a month later on May 27. Plover nest initiations continued through May and June with the last being recorded on June 24. The first observation of terns on Lewis Clark Lake was May 31. The first tern nest on the lake was initiated on June 21, the last tern nest initiation was on June 27.

Gavins Point River: The Gavins Point Reach endured a second consecutive year of high releases from Gavins Point Dam that resulted in extremely limited habitat for the two species. The above average releases were necessitated by high water levels in the reservoirs throughout the Missouri River system. Releases in April averaged 40,000 cfs. (A record high for that month.) Releases in May averaged 38,500 cfs. June's average release of 40,900 cfs was the second highest on record for that month. The average release of 48,800 cfs in July was also the second highest on record for that month. Average releases for May, June, and July would have been even higher except for flooding downriver of Gavins Point that required temporary, though significant, reductions in releases during those months. These high releases, that peaked at 53,300 cfs in July, in turn flooded most of the sandbar habitat in the reach. By July, 90 to 95% of all habitat was under water.

Piping plovers returned to the Gavins Point Reach during the first two weeks of May. The earliest nest initiation by a plover on the reach was May 17. This was also the day of the first survey on the reach. The latest nest initiation for a plover on the reach was June 25. Least terns were first observed on the Gavins Point Reach on May 28. The first nest

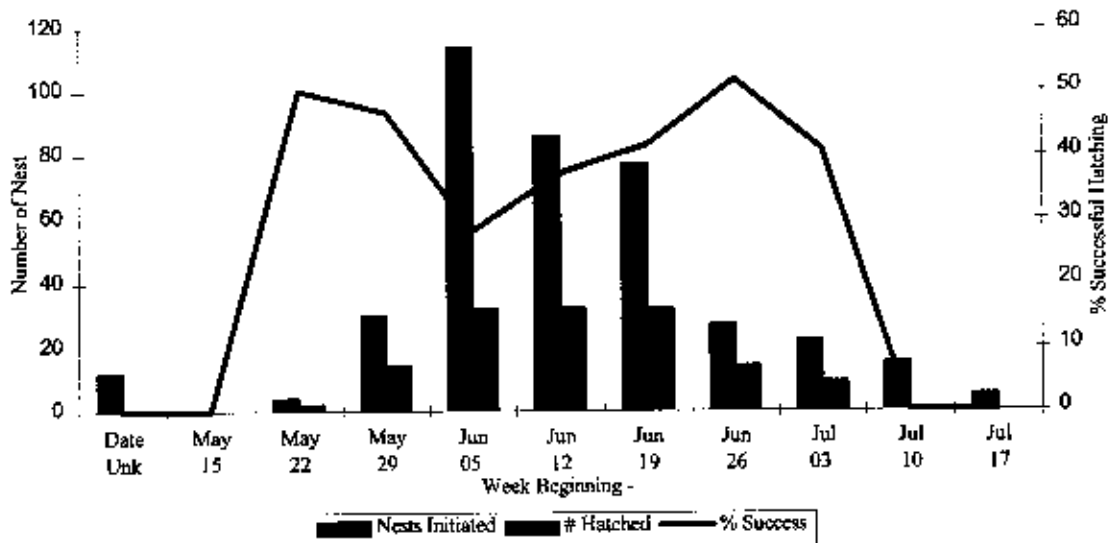
initiations for terns on the reach occurred a week later on June 6. The latest nest initiation for terns occurred on July 16.

As the chart on the next page shows, systemwide piping plover nest initiations peaked from the week beginning May 29 through the week ending June 18. Hatching success was highest for nests initiated from June 12 to June 25.



As illustrated on the next page, systemwide least tern nest initiations peaked for the week beginning May 29 with substantial number of nests being initiated for the following two weeks. The blue line shows that hatching success increased the later the nest was initiated throughout the month of June.

Least Tern Nest Initiations & Nest Success by Week - 1996



ADULT CENSUS

In 1996 the annual adult census was conducted as part of the International Piping Plover Census. This, once every five years census, was conducted for the breeding grounds throughout the United States and Canada during the first two weeks in June. However the annual breeding adult census on the mainstem Missouri River system has historically been standardized for the last week in June through the first week in July. In an attempt to preserve trend integrity it was decided to conduct the 1996 adult census during the last two weeks in June. Moving the census to this time period would conform somewhat to the international census. It would also allow this year's census data to be comparable to previous and future censuses on the Missouri.

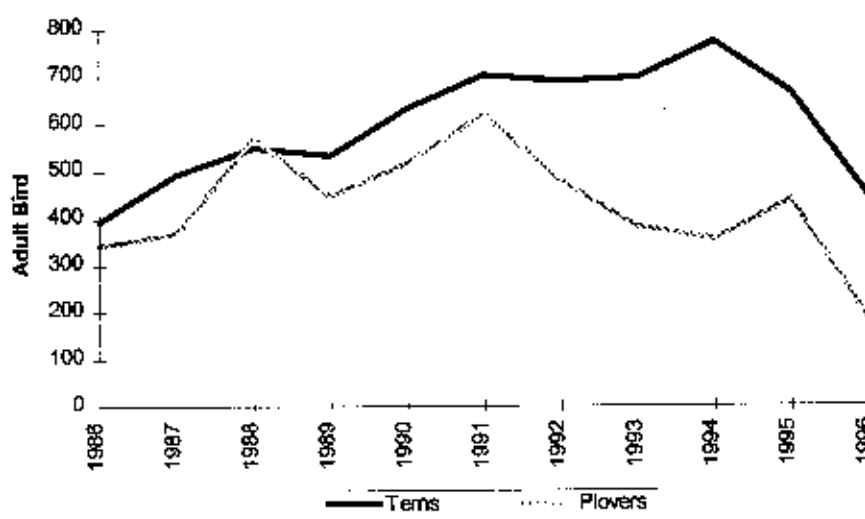
The adult census for the mainstem Missouri River system was conducted with the aid of a boat and binoculars or spotting scope. Adults were counted either while incubating clutches, loafing on the sandbar, or flying overhead near the colony sites. If heavy vegetation existed on an area, preventing observation of adults on the ground, sites were entered, causing the birds to flush where they were then counted in the air. On sites with large nesting colonies, where bird activity makes actual counts improbable, the census count was recorded as twice the number of active nests plus the brooding pairs. Date, time, observers, weather conditions, and site location was recorded during entry of each census record. (See Appendix A for front and back examples of census record cards.) All terns and plovers observed on the Missouri river having adult plumage were recorded as breeding

adults. The dates when the adult census was conducted, by reach, are listed on the following page.

Fort Peck Lake	June 20, 25, 26
Fort Peck River	June 24-27
Lake Sakakawea	June 20-22, 24-29
Garrison River	June 17, 24, 26
Lake Oahe	June 18, 27, 28
Fort Randall River	June 18
Lewis and Clark Lake	June 24
Gavins Point River	June 18-21

The 1996 adult census for the Missouri River showed a precipitous decline in adult numbers for both species. The adult census for 1996 found 182 piping plovers and 444 least terns within the Missouri River system. These numbers represent a 58% decline (182/437) in plover numbers and a 33% (444/664) decline in tern numbers compared to 1995. They further represent a 71% decline (182/618) in plover numbers compared to the peak year of 1991 and a 42% decline (444/772) in tern numbers compared to the peak year of 1994. The graph below depicts eleven years of adult censuses on the Missouri River system.

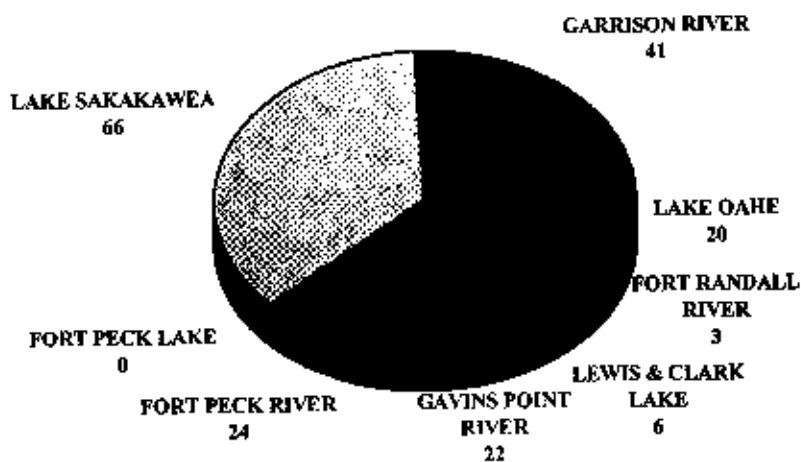
Adult Census - Missouri River System 1986 - 1996



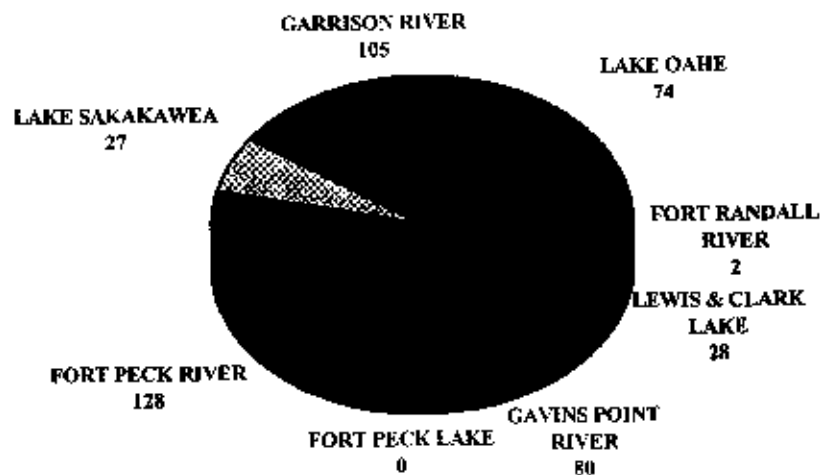
It should be noted that the years 1986 and 1987 represent incomplete censuses. Censuses were not done for the Fort Peck River and Lake Sakakawea reaches during those years.

The drop in plover and tern census numbers on the Missouri River likely was the result of high water levels in the reservoirs and high releases out of the dams. A reach by reach distribution of the birds within the system is shown on the following pie charts.

PIPING PLOVER ADULT CENSUS BY REACH - 1996

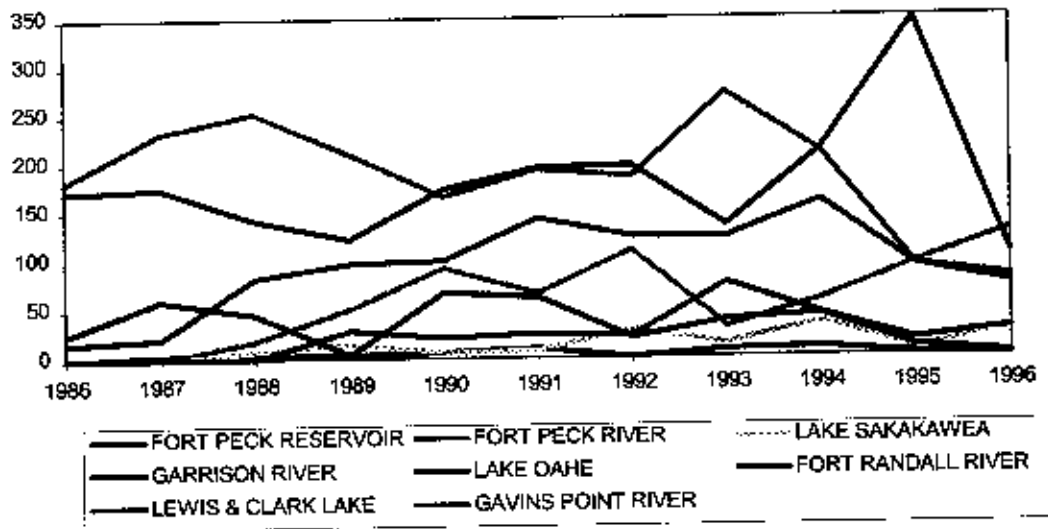


LEAST TERN ADULT CENSUS BY REACH - 1996



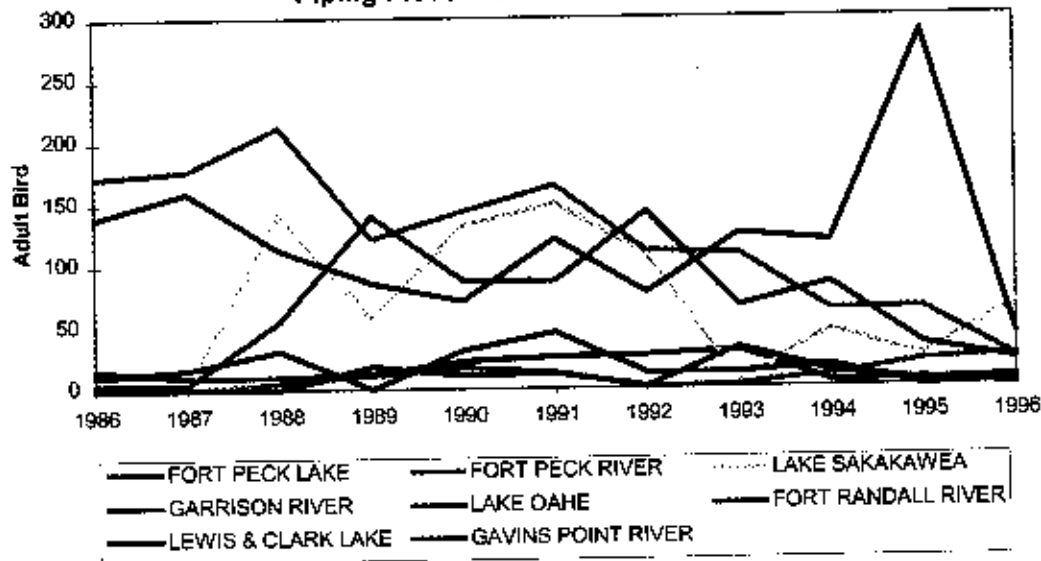
The adult census by reach for 1986 - 1996 is shown on the following two graphs.

Adult Least Tern Census 1986 - 1996



Least tern numbers were much reduced on the Garrison River reach in 1996 compared to 1995. This likely was a result of abundant habitat being available in 1995 due to low water releases from Garrison Dam. Conversely the high water releases from the dam in 1996 greatly reduced habitat availability. Least tern numbers on the Gavins Point River reach were depressed in both 1995 and 1996 by high releases from Gavins Point Dam. However the Fort Peck River reach has seen a steady increase in tern numbers over the past three years.

Piping Plover Adult Census 1986-1996



As was the case with least terns, the rise and fall of plover numbers on the Garrison River Reach from 1995 to 1996 was related to water releases out of Garrison Dam. Likewise the plover numbers for Lake Oahe and Lake Sakakawea are related to lake levels. Numbers were relatively high during the drought years of 1988 - 1992 and then dropped off as the lake levels rose from 1993 - 1996. A negative trend has been observed since 1991 for plover numbers on the Gavins Point Reach. This situation likely has been exacerbated by the high releases from Gavins Point Dam in 1995 and 1996.

PRODUCTIVITY AND RECRUITMENT OF FLIGHTED CHICKS

Productivity monitoring provides a standard of measurement onto which success or failure of implemented management practices can be evaluated. The most critical scale of any recovery effort must be rated with the return gained from annual reproductive efforts or in the recruitment of young to the adult population. No matter how much habitat is created or prudent measures implemented, nothing will recover piping plover and least tern populations unless annual productivity exceeds annual mortality. In light of this, fledge ratio goals (number of juveniles produced annually per pair of breeding adults) were established by the Biological Opinion to give the Corps a target to meet in implementing management activities on the Missouri River. Correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting recovery goals. Every effort was made to accurately collect and report all aspects of the productivity monitoring activities during 1996.

Sites identified, through early habitat use surveys, to contain active nesting colonies were revisited every seven - ten days during the duration of the summer to record nesting activity and chick survival. (The exception was the Fort Peck River Reach where productivity was geographically subsampled.) Active nesting sites were searched to determine the number of nests and principle causative factors responsible for nest termination. Each colony was searched on foot with the aid of binoculars. Nests were located by observing adult behavior or by doing systematic searches of the colony site. Each nest was identified by placing a numbered wooden tongue depressor within one meter of the nest. Nests were relocated every seven to ten days until the nest was terminated. All on site activity was limited to thirty minutes or less including any passive predator management activities.

Information collected was recorded on a standardized nest card and included species, number of eggs, stage of incubation, nest location, nest initiation date, and nest fate. (See Appendix A for front and back examples of nest cards.) Stage of incubation was

obtained through use of the egg flotation method. Only eggs from nests with complete clutches were floated. Cause of nest termination was recorded as hatched or destroyed, with hatched nests being determined by the presence of chicks, egg shells, pipping fragments or chick excrement in the nest bowl. A nest was considered successful if a single egg hatched.

Attempts were made to identify destroyed nests to a principle causative factor. These included but were not limited to; flooding, weather, human disturbance, predation, and abandonment. If a cause could not be determined the nest was listed as destroyed - unknown. If it could not be determined if a nest had hatched, the nest was listed as fate unknown.

Chick survival was recorded simultaneously during weekly nest searches of nesting areas. As the breeding season progressed, efforts were concentrated on locating chicks and keeping track of fledged chicks using natal areas. Chicks were typically flushed ahead of observers on the nesting sites and aged by visual observation of size and primary feather development. Care was taken to prevent chicks from fleeing into the water during observation activities. Chicks were tracked during the fledging period by recording each observation on the chick record portion of the adult census card. Because of a high probability of fledging before the next week's visit, twenty-two day old plovers and fifteen day old least terns were considered fledged.

Productivity throughout Missouri River system was poor for least terns and piping plovers in 1996. The lack of habitat caused by high water levels throughout the system, resulted in concentration of nesting efforts. This led to increased predator efficiency and compounded catastrophic losses to weather related events. Nearly 40% of all piping plover and least tern eggs laid on the Missouri River during 1996 were salvaged from rising water conditions and captively reared (see Captive Rearing Page 41). Results of the 1996 production surveys are given for terns (Table Page 30) and for plovers (Table Page 30). See Appendix B for a site by site synopsis of the mainstem system. A reach by reach summary of productivity follows after the tables.

REACH	NESTS	NEST HAT	NEST COLL	NAT 4 COLL	NEST BUCC	SESS	SESS HAT	SESS COLL	SESS COLL	CALL HAT	CALL COLL	CHIRUS COLL	FLUGS	RATE OF TURNS			H. DIST.	W. TAIL	NESTOC	UNKN	UNKN	ADULT CENSUS	ADULT CENSUS	ADULT CENSUS	ADULT CENSUS
														PRED.	PREV.	PREV.									
FTPARS	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FTPARIV	6	3	0	0	50.0	23	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NSKORS	43	17	15	0	38.5	159	59	41	48	0	0	0	5	1	0	0	2	1	0	0	0	0	24	6	0
GAORRIV	26	1	8	0	3.8	69	2	21	18	0	0	0	1	1	1	0	0	0	0	0	0	1	65	20	43
LOKORRS	18	2	0	0	11.1	45	6	0	0	0	0	0	4	4	0	0	0	0	0	0	0	2	41	2	16
FTPARIV	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	3	0
UECLES	18	0	17	0	0.0	39	0	38	31	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
GAORIV	14	0	8	0	0.0	36	0	20	15	0	0	0	0	0	0	0	0	0	1	0	0	0	6	0	28
TOTAL	125	23	50	0	18.4	361	72	140	135	0	0	0	10	8	1	1	15	1	2	9	4	152	30	102	102

[illegible]

Fort Peck Lake: There was no known productivity on Fort Peck Lake in 1996 by either plovers or terns. Nesting habitat was inundated due to high water levels on the lake.

Fort Peck River: Again in 1996 two subsamples of this reach were monitored. The west subsample contained six least tern nesting sites; compared to seven in 1994. Nesting success for the terns was 55% eleven of twenty nests hatching. Of the unsuccessful nests two were abandoned, two were lost to predators (one mink and one bird), one was lost to weather, one to bank erosion, and the fate of three of the nests were unknown. Twenty-five tern eggs were known to have hatched. But of these only four fledged. Mink are suspected as being the primary reason for tern chick mortality.

For the east subsample no habitat was available through May and June due to high inflows from the Yellowstone River. After flows from the Yellowstone abated in July terns again colonized an island at RM 1580.0. Eight nests were found in the colony. Five were lost to hail and rain storms and the fates three nests were not determined. Some chicks most likely hatched from these nests for three chicks were found and eventually fledged. The least tern fledge ratio was 0.34 fledglings per adult pair on the Fort Peck River Reach in 1996.

As in 1995, piping plovers were found only on the west subsample of the reach. Number of nests found on this subsample doubled from three to six compared to 1995. These six nests were found at four locations on the reach. Three of the nests successfully hatched. Two of the nests were lost to predation by mink and the third nest was lost to bank erosion. Eight plover eggs were known to have hatched, with five chicks known to have fledged. The piping plover fledge ratio was 1.00 fledglings per adult pair on the Fort Peck River Reach in 1996.

Lake Sakakawea: As previously mentioned Lake Sakakawea experienced above normal lake levels during the late spring and early summer as it did in 1995. However the number of least tern nests found on the lake increased substantially to nineteen in 1996, compared to two found in 1995. These nests were found at three sites on Lake Sakakawea. All three of these colony sites were at locations not previously known to support least tern nesting efforts. Eight of the nests were on an island in the Van Hook Arm. Four of these nests hatched, three nests were lost to flooding, and one was lost to undetermined causes. Additionally, there were two tern nests at Steinke Bay and both were lost to flooding. Six eggs hatched at an island in the Van Hook Arm. Two of these six chicks were known to have fledged for a fledge ratio of .15 fledglings per adult pair on Lake Sakakawea in 1996.

The remaining nine tern nests on Lake Sakakawea were in a colony at Deepwater Bay. With Lake Sakakawea anticipated to continue rising throughout June, it was determined by project staff that the colony site would be flooded before the eggs hatched. Therefor on June 17, with the lake elevation at 1845.5 feet msl and expected to rise an additional two feet in the next ten days, all 23 eggs from these nests were removed and transported to the Gavins Point Project for incubation.

The piping plovers were widely distributed across Lake Sakakawea with nests being found at fourteen sites around the lake. Two of these sites represent locations that did not have any known plover nests in 1995. Nest success for plovers on the lake was good considering the deterioration of habitat condition during the continued rising of the lake to above normal levels. Overall hatching success was 39.5% (17/43). Independence Point, Steinke Bay, the Van Hook Arm Islands, Little Egypt, and Deepwater Bay were the leading areas for plover nests. Five plover nests were lost to flooding on the lake, two to weather, one to a predator, one to livestock, and one nest was abandoned. A total of 56 plover eggs were known to have hatched at Lake Sakakawea. Of these, 20 fledged giving the lake a fledge ratio of 0.61 fledglings per adult pair.

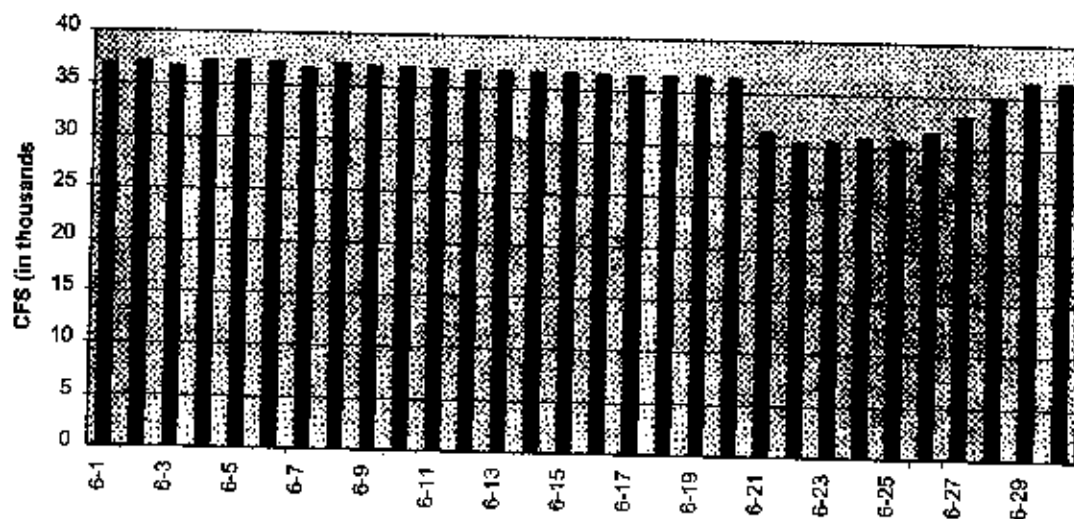
In mid June the nesting sites on Lake Sakakawea were surveyed to ascertain those that were endangered by the rising lake level. Of the 28 plover nests located at that time, it was determined that 16 would be flooded or could not be moved to higher ground before the eggs hatched. On June 17 the 61 eggs of these nests were collected and transported to the Gavins Point Project for incubation.

Garrison River: As could be expected with the high releases out of Garrison Dam, the number of nesting sites on the Garrison River Reach declined dramatically in 1996 compared to 1995. Only 13 sites had tern nests compared to the 29 tern nesting sites found in the low release year of 1995. The number of tern nests fell by 45% with only 88 being found compared to 1995's 159. Nest success was only 9.1%. Eight tern nests were known to hatch. Weather was the primary factor in nest failure destroying 32 nests. Rain storms accompanied by hail swept through the reach on several occasions. Of the remaining nests, nine were lost to flooding, two were abandoned, one tern nest was lost to human disturbance and the fate of six nests were not known. Fourteen tern eggs were determined to have hatched on the reach. Of these only four chicks were confirmed to fledge. The reaches' fledge ratio was 0.08 fledglings/adult pair.

A combination of factors necessitated the removal of eggs from the reach in late June. The terns had been nesting on the beaches of islands not inundated by the high

releases out of Garrison Dam. However, two severe thunderstorms during the third week in June destroyed most of the nests within the reach. On June 21 releases out of Garrison Dam were reduced temporarily. The reduction was in response to a reduction in releases out of Gavins Point Dam due to flooding in Iowa and Nebraska. When releases out of Oahe Dam were reduced, Lake Oahe, already in the exclusive flood zone, could not absorb a continuation of the high releases out of Garrison Dam. The reduction of releases out of Garrison exposed previously flooded nesting habitat at a time when the terns and plovers were renesting. The majority of the birds renested on these newly exposed areas. These sites would be inundated when the high releases were to be resumed on June 29. Therefore on June 28 fifty-seven eggs from thirty tern nests were removed and transported to the Gavins Point Project in Nebraska. The eggs were incubated and chicks were captively raised. The graph below shows water releases out of Garrison Dam for June.

GARRISON DAM RELEASES - JUNE 1996



Piping plovers nested at thirteen sites within the reach. This represents a 68% decrease (13/41) compared to 1995. There was an 81% decline (26/136) in the number of plover nests compared to 1995. The plovers had a nest success of 4% on the Garrison River Reach with only one nest successfully hatching. The two eggs that did hatch both resulted in fledged chicks. This led to a fledge ratio of 0.01 for the reach. The leading cause of nest failures was destroyed-weather with eight. Other nest losses were due to flooding - one, predator - one, human disturbance - one, and abandonment - three. As with the terns, plover eggs were removed on June 28 before an increase in releases from Garrison Dam inundated the exposed beaches in the reach. Twenty-one eggs from nine nests were collected and transported to the Gavins Point Project for incubation and rearing.

Lake Oahe: In 1996 Lake Oahe experienced a near record high lake level, close to that of 1995. This limited least tern nesting to just three sites; Dredge Island (RM 1270.0), Indian Creek (RM 1192.3), and an island at RM 1158.1. The majority of the nests, 36 of 44, were found at Dredge Island. Only five of the 36 nests successfully hatched and no chicks were known to have fledged. As in past years weather was the leading cause for nest destruction with eight. Five nests were abandoned, one nest was flooded, and the fate of seventeen nests is not known. Weather is suspected as playing a role in many of the unknown fates. Indian Creek had one tern nest that successfully hatched two eggs. These two chicks successfully fledged. The island at RM 1158.1 had a tern colony of six nests. Four of these nests successfully hatched and the fate of the other two nests is unknown. Eight eggs were known to have hatched and seven chicks fledged. Overall nest success for least terns on Lake Oahe was 23.3% (10/43). The fledge ratio was 0.24 fledged chicks per adult pair.

Piping plovers nested at five locations on Lake Oahe. The largest concentration of plover nests was at Dredge Island which accounted for fourteen of the eighteen nests found on the reach. Single nests were found at Indian Creek, Plum Creek, Mission Point, and Mission Island. Nest success for the plovers was 11.1% (2/18). One nest hatched at Dredge Island and one hatched off of Indian Creek. No chicks fledged at Dredge Island but three plover chicks did fledge at Indian Creek. The piping plover fledge ratio for the Lake Oahe was 0.30 fledged chicks per adult pair. Weather destroyed five plover nests, four were lost to flooding, four to predators, one nest was abandoned, and the fate of two nests is not known.

Fort Randall River: High releases out of Fort Randall Dam flooded almost all of the nesting habitat on the Fort Randall River reach during the 1996 nesting season. Only one least tern nest was found within the reach. This nest was lost to flooding a week after it's discovery.

Lewis & Clark Lake: Seven least tern nests were found at two locations on the lake in 1996. The eggs from all of these nests were collected on June 28 to prevent their loss from rising lake levels. Eighteen piping plover nests at five locations were found on the lake during 1996. The eggs of seventeen of these nests were collected in June to prevent their loss due to the anticipated rise of the lake. Ten nests were collected on June 6, three were collected on June 13, and four were collected on June 28. The eighteenth nest could not be relocated and was assumed destroyed. All of the plover and tern eggs collected off of Lewis

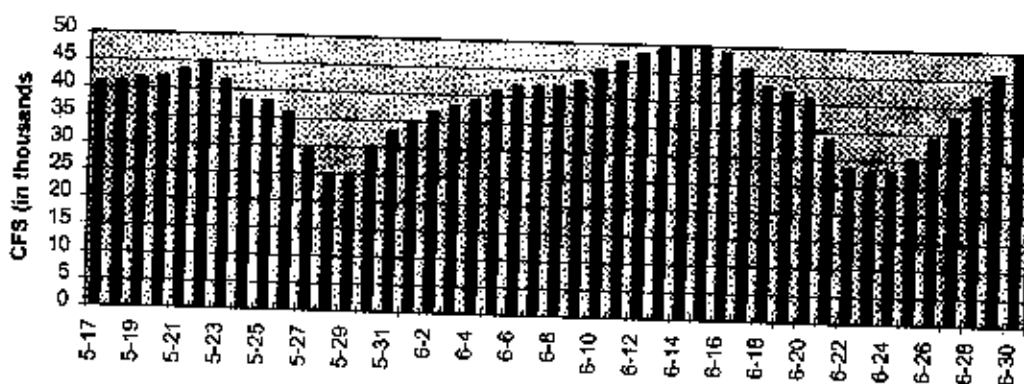
& Clark were taken to the Gavins Point Project for incubation. There were no nests that successfully hatched on Lewis & Clark Lake in 1996.

Gavins Point River: Least tern nest numbers on the Gavins Point River reach in 1996 were down compared to 1995. There were 96 tern nests found on the reach in 1996 compared to 118 in 1995. This number is deceptively high as many of the 96 nests represent re-nests by birds at locations where nests were collected. Only six tern nests were known to have successfully hatched, 56 nests were collected, two nests were predated, four were abandoned, thirteen were destroyed by unknown causes, and the fate of fifteen nests was unknown. There were eleven known fledged tern juveniles at RM 804.5. The fledge ratio for the reach was 0.28 fledglings per adult pair during 1996.

Productivity for piping plovers was non-existent on the Gavins Point Reach in 1996. Only 16 plover nests were found on the reach in 1996 compared to 56 in 1995. None of these nests hatched; 8 were collected, 1 was lost to predation, 1 was destroyed due to unknown causes, and the fate of 4 nests was unknown. There was no known fledging of plover chicks on the reach in 1996.

For the second consecutive years piping plover and least tern eggs were collected on the Gavins Point River Reach to prevent their loss from flooding. As the chart below shows, releases out of Gavins Point Dam were reduced for significant time periods twice from May through June.

Gavins Point Releases - Mid May thru June 1996



These reductions were necessary to offset heavy rainfalls that caused downstream tributaries and the Missouri River below Gavins Point to exceed flood stages. Birds holding in these areas quickly responded to the declining water levels and initiated nests on the newly exposed beaches. To further complicate the situation, as a result of these periodic reduction in releases, higher releases would be required to evacuate water and would

endanger previously safe nests. In anticipation of these higher releases, twelve tern nests and six plover nests were collected from June 10 to June 12. Four more tern nests were collected on June 14. On June 17 two tern nests that were 49 and 51 miles downriver of the dam were collected before the high releases of June 13 - 15 reached them. Another major collecting effort was done on June 26 & 27 when twenty-eight tern and two plover nests were collected off the reach. One last collection of nests was accomplished on July 15. On that day twelve tern nests were collected from RM 804.5 after it was forecast that releases would be increased from 52,000 cfs to 55,000 cfs out of Gavins Point.

HABITAT MANAGEMENT

Due to high reservoir levels and high releases from the dams above the river reaches very little habitat improvement work was done in 1996. What work was done is summarized in a reach by reach description.

Fort Peck Lake: No habitat improvement work was done.

Fort Peck River: No habitat improvement work was done due to high releases out of Fort Peck Dam.

Lake Sakakawea: A 150 foot x 400 foot 1.4 acre site was developed adjacent to Steinke Bay on the DeTrobriand Wildlife Management Area in the fall of 1996. Vegetation was bladed off the site and the ground was then scarified. A total of 700 cubic yards of gravel was then placed on the site. The work was done above the normal operating pool level of 1850.0 feet msl. The site is located to the east of a popular recreation area where plovers have attempted to nest the past two years. The site is protected from public access by a fence and a gate.

Garrison River: No habitat improvement work was done due to high releases out of Garrison Dam.

Lake Oahe: In the fall of 1996 Dredge Island was treated with a herbicide to reduce vegetation on the island. Around 75 - 80% of the island's vegetation was eliminated by the treatment.

Fort Randall River: No habitat improvement work was done due to high releases out of Fort Randall Dam.

Lewis & Clark Lake: No habitat improvement work was done.

Gavins Point River: No habitat improvement work was done due to high releases out of Gavins Point Dam.

MANAGEMENT ACTIONS

Several management actions were undertaken to protect nesting sites, increase productivity, and increase public awareness. Some of these measures have been ongoing for several years. Others have been done on a limited basis or had not been attempted previously. These management actions are discussed below with the exception of the Captive Rearing Program which is discussed under it's own section.

Predator Aversion Measures

Predator exclosure cages were utilized to increase survival of piping plover nests. Cages were constructed of either 2"x 4" or 2"x 2" welded wire mesh and were 2' x 2' x 2' in size. The cages were held in place with electric fence t-posts or by 14" wire hook stakes. Assembly and installation time required approximately five minutes. Cages were assembled on site during the time allowed for productivity monitoring activities. Hands were washed with no scent soap prior to the handling of any cage components. After cage installation the nest was monitored to ensure that the nesting adult returned to the nest. In one case at Lake Sakakawea a nesting adult refused to enter the cage. The cage was then removed and the adult resumed nesting. Otherwise there was no apparent avoidance of caged nests by piping plovers.

Cages for piping plover nests were not used or saw limited use on all but one of the reaches. The exception was Lake Sakakawea where cages were installed over thirty of the forty-three plover nests. Overall 34% (42/125) of the piping plover nests on the Missouri River System were caged. There are several reasons why cages were not placed over other plover nests. In some cases it was not possible to place a cage due to the proximity of vegetation or other obstructions next to the nest. Cages were not placed over nests where the eggs were pipping or already hatched. On several occasions cages were not available the day the nest was discovered and the next visit found the nest destroyed. Several newly

discovered nests were not caged due to the imminent removal of the eggs for the captive rearing program.

Survival was higher for plover nests that were caged than for nests that were not caged. Thirteen of forty-three caged nests (30%) had eggs that hatched whereas only ten of eighty-three uncaged nests (12%) had eggs that hatched. These numbers however are not a true indicator of cage effectiveness for many of the causes of nest failure such as egg collection, flooding, and a weather event have nothing to do with predation. Looking only at predation of plover nests, nine nests on the Missouri River system were lost to predation in 1996. Of these only one was caged. (A mink dug under the cage to get to the nest.) However one nest may have been lost because it was caged. In this case the cage was missing from the nest and human footprints were found around the nest. The cage may have attracted human curiosity.

Restrictive Sign Posting and Fencing

Nest sites close to or within recreation areas or areas with the high potential for human disturbance were posted signs restricting access. These signs informed the public of the presence of endangered species and prohibited entry into the restricted area. The restricted area could further be delineated with orange twine strung on steel posts. A reach by reach description follows.

Lake Sakakawea Reach: One plover nest along the shoreline adjacent to the Little Egypt Recreation Area was fenced off to protect from ATV traffic. With one side dominated by a bluff, the nest was fenced on three sides with a plastic snow fence. Large holes were put in the bottom of with a piece of driftwood acting as an arch to allow the nesting adults walking access to the shore. The plovers were observed several times using this exit from the enclosure.

Lake Oahe: Restricted access signs and an orange twine barricade were set up on Dredge Island. Signs were also placed at the plover sites at Plum Creek and Mission Point. The upper parking lot at the Indian Creek boat ramp was fenced off and signed to protect the plover nest located there. Likewise the cul de sac and a portion of the Indian Creek Campground were fenced off and signed to protect the tern nest in the cul de sac.

Nest Relocation

Relocating nests was undertaken to prevent the destruction of nests threatened by rising lake or river levels. Nests were moved by using various techniques from moving the entire nest and surrounding substrate to creation of a new nest site. After moving, the nest was watched to see if the adult found the new location. If the adult was unable to locate the new site the nest was returned to the old location and usually collected for captive rearing.

Fort Peck River Reach: Three Piping plover nests were moved on the Fort Peck River Reach. Two were endangered by flooding and the third by bank erosion. Each nest was moved about fifteen feet. In two of the three moves the nesting adult was able to find the new nest location. In the third case the two adults were unable to find the new nest site. The nest was then moved about five feet back toward the original nest site. After this move the adults were able to find the nest. One of those nests had a successful hatching of eggs. The other two nests were lost to mink predation.

Lake Sakakawea: Attempts were made to relocate seven nests, two tern and five plover, during the nesting season on Lake Sakakawea. All seven nests were successfully moved with one nest being moved three times and another twice. Three nests, the two tern and one plover, unfortunately were still lost to flooding. One of the plover nests was abandoned, one nest had a successful hatching and the other two plover nests were collected. The nest that was moved three times was the plover nest that was lost to flooding. The nest that was moved twice was the plover nest that had a successful hatching.

Lake Oahe: One plover nest was successfully moved on Lake Oahe at Plum Creek. This nest however succumbed to the rapidly encroaching water.

Other Activities

Fort Peck Lake: Livestock grazing was modified on four habitat units of the Charles M. Russell NWR along the shoreline of Fort Peck Lake. The turn in date was delayed until July 15 to provide an extra margin of security for nesting plovers. Hopefully with reduced lake levels and improved habitat conditions, this action will improve plover nest success and fledge ratios in these management units.

Lake Sakakawea: A pair of adult plovers were observed in the upper parking lot at the Steinke Bay boat ramp on May 15. A survey of the area located a nest bowl in the

parking lot which was filled in. Coffee cans and streamers were placed on poles throughout the parking scare the birds from the area. Apparently effective, the plovers were not seen in the boat ramp area.

Lake Oahe: The location of the plover nest in the upper parking lot of the Indian Creek boat ramp presented a problem of access to the water for the chicks. For the chicks to reach the lake they would have to cross the parking lot and navigate through vehicle traffic. The Mobridge staff solved this problem by installing a 500 gallon water tank on a flat bed trailer. The trailer was then positioned so that water would drip out of the tank into the nesting area. The plovers readily used this water source. When the tank ran dry the trailer was removed, the tank refilled, and the trailer returned. The Mobridge staff noted that both the chicks and the adults would come running up to the truck when they brought back the trailer after a refill.

Public Awareness

Public awareness of the status of the least terns and piping plovers on the Missouri River System was accomplished by several means including interpretive programs at Corps of Engineers campgrounds and off site, newspaper articles, television and radio interviews, public service announcements, and information signs.

Specimen Collection for Contaminate Analysis

The following specimens were collected during field activities and will be forwarded to respective federal contaminate labs for analysis: 4 least tern adults, 6 least tern chicks, 22 least tern eggs, and 13 piping plover eggs.

The following specimens were obtained during the captive rearing program at the Gavins Point Project and will be forwarded to respective federal contaminate labs for analysis: 4 least tern juveniles, 2 least tern chicks, 17 least tern eggs, 2 piping plover juveniles, 3 piping plover chicks, and 8 piping plover eggs.

SPECIAL STUDIES

Yellowstone River: For the third consecutive year a survey of least tern and piping plover responses to hydrograph induced changes in habitat attributes was conducted on the Yellowstone River from Miles City to Crane Montana. The purpose of the study is to investigate responses of least terns and piping plovers to a natural river hydrograph dominated by mountain snowpack melt and subsequent summer precipitation pulses.

During the 1996 field season, nineteen least tern adults were observed at five locations along the river. Six tern nests were found at four sites and all six had successful hatchings. Four tern chicks were known to have fledged for a fledge ratio of 0.42 fledglings per adult pair. No piping plovers were observed on the Yellowstone in 1996.

Niobrara River: A study, complementing the Yellowstone River Study, was initiated on the Niobrara River in 1996. The study area includes 100 miles of the river from Springview, Nebraska to the Niobrara's confluence with the Missouri River near Niobrara Nebraska. The purpose of the study is to determine landscape attributes of least tern and piping plover nesting sites on a prairie river with a natural river hydrograph. In 1996, 318 least tern adults and 104 piping plover adults were observed during the annual census of the Niobrara. During the 1996 breeding season, 213 tern nests were found, of which 117 hatched for a 54.0% nest success. A total of 126 plover nests were found, of which 42 hatched for a nest success of 33%. A total of 307 tern chicks were observed, of which 96 of these chicks fledged. A total of 152 plover chicks were seen and 37 of these chicks fledged. Least terns on the Niobrara had a fledge ratio of 0.60 fledglings per adult pair while piping plovers had a fledge ratio of 0.71 fledglings per adult pair.

Nest variables measured consisted of determining if the nest was initiated in wet or dry sand, substrate type, dominant plant species next to nest, and percent of vegetative cover within one meter of the nest bowl center. The approximate mean height of the surrounding vegetation, nest elevation above the water, and the nest's distance from the water were also recorded.

CAPTIVE REARING PROGRAM

As previously detailed, the Missouri River main stem system experienced runoff nearly 170 percent of normal during the spring of 1996. For the second year in a row, this runoff nearly filled to capacity the available storage within the Missouri River reservoir system. As in 1995, this above average runoff required the Corps to enter into flood water evacuation service level on the river. With these unstable conditions and daily changes to system releases, availability of nesting habitat changed rapidly and subsequently jeopardized nesting efforts on several reaches of the Missouri River. In an effort to prevent dramatic losses of nests initiated on unsecure habitats, the Corps, under authority of the amended 1996 subpermit 93-07, conducted an egg salvage operation and captively reared chicks for release back into the wild.

Eggs collected during 1996 were only those ultimately determined to be in imminent danger of being inundated during the evacuation of stored flood waters. All efforts were made to retain viability of natural nesting sites. Nests predicted (through UNEF modeling) to be inundated by a scheduled flood water evacuation release were collected along with nests predicted to be flooded by rising reservoir elevations. Attending adults were allowed to incubate the eggs until just prior to the inundating flow. This ensured that the birds did not attempt to renest on the jeopardized habitat prior to it being covered. Egg collections, incubation, rearing and release were conducted according to approved protocols (see *Captive Rearing Protocol* appendix B in the Corps' Least Tern and Piping Plover Management Plan, 1996 Missouri River Operations).

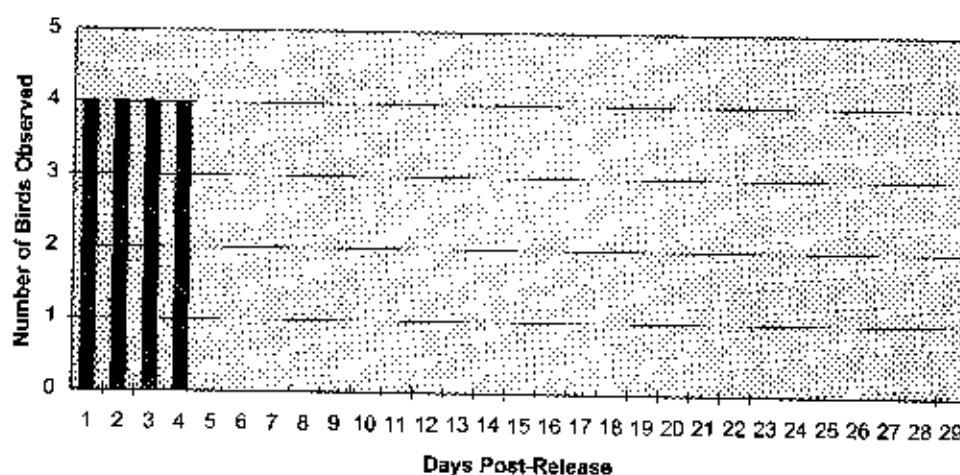
During the 1996 salvage effort, 38.8% of the plover eggs (140/361) and 37.5% of the tern eggs (204/544) located on the Missouri River, were collected. Hatching success for the piping plover eggs was 82% with 89% of the chicks hatched eventually fledging and being released. Least tern hatching success was 90% with 96% of the chicks hatched fledging and being released. The table on the next page contains a reach by reach account of the 1996 collection and captive rearing efforts.

	Piping Plovers				Least Terns			
	<u>Collect</u>	<u>Hatch</u>	<u>Release</u>	<u>Re/Hat</u>	<u>Collect</u>	<u>Hatch</u>	<u>Release</u>	<u>Re/Hat</u>
Lake Sakakawea	61	48	43	90%	23	22	21	95%
Garrison Reach	21	18	15	83%	57	53	51	96%
Lewis & Clark Lake	38	31	29	94%	16	13	13	100%
Gavins Point Reach	20	18	15	83%	108	95	91	96%
Total	140	115	102	89%	204	183	176	96%

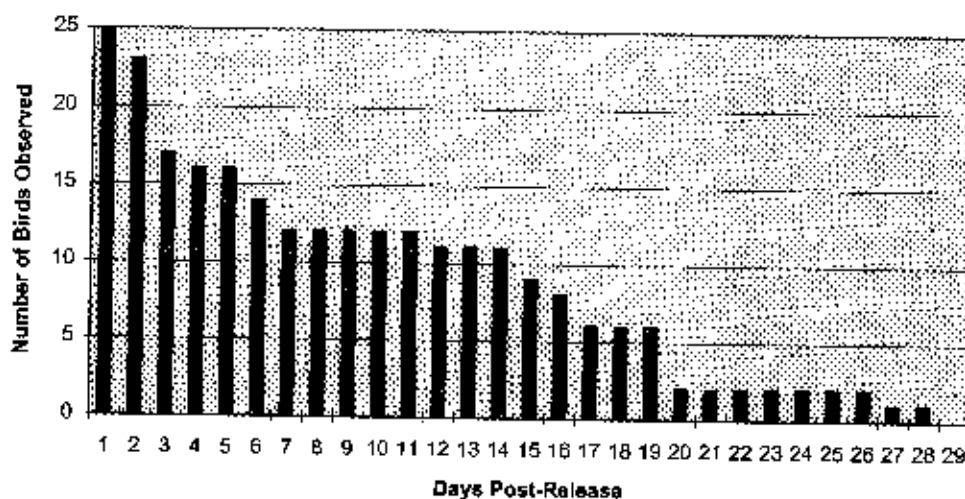
Fledged least terns and piping plovers were released on secure habitats once they had shown the ability to be able to procure the own food. In 1996, least tern and piping plover fledglings were released on the Gavins Point and Lewis and Clark reaches along with the lower ten miles of the Niobrara River in north central Nebraska. In addition, several least terns were released on the Platte River in central Nebraska near Ashland. Prior to release, all piping plovers were banded with an aluminum or stainless steel 1A or 1B USFWS leg band on their left tarsometatarsus and with a light blue Darvic™ flag on their right tibiotarsus. Least terns were banded with an aluminum or stainless steel 1A USFWS leg band on their left tarsometatarsus.

In an effort to determine short-term post-release survival of captive reared chicks, 25 least tern and 25 piping plover chicks were fitted with radio transmitters. These one gram transmitters manufactured by Wildlife Materials Inc. were epoxied to feather shafts on the dorsal side of the birds with a specially formulated epoxy. The design of the transmitter allowed observers to track movements and estimate survival for up to 30 days post release. Transmitted birds were released on the Gavins Point and Lewis and Clark reaches along with the Niobrara River. Preliminary results of the tracking effort are presented on the next page.

Least Terns



Piping Plovers



Thank you to the following Project Offices and their crew of dedicated staff who have diligently conducted the surveys, compiled the data, and submitted the annual field reports.

CHARLES M. RUSSELL REFUGE, FORT PECK - USFWS

FORT PECK PROJECT OFFICE

GARRISON PROJECT OFFICE

OAHE PROJECT OFFICE

CHEYENNE RIVER SIOUX TRIBE- GAME, FISH, AND PARKS DEPT.

FORT RANDALL PROJECT OFFICE

GAVINS POINT PROJECT OFFICE

Casey D. Kruse
Wildlife Biologist

Greg Pavelka
Wildlife Biologist